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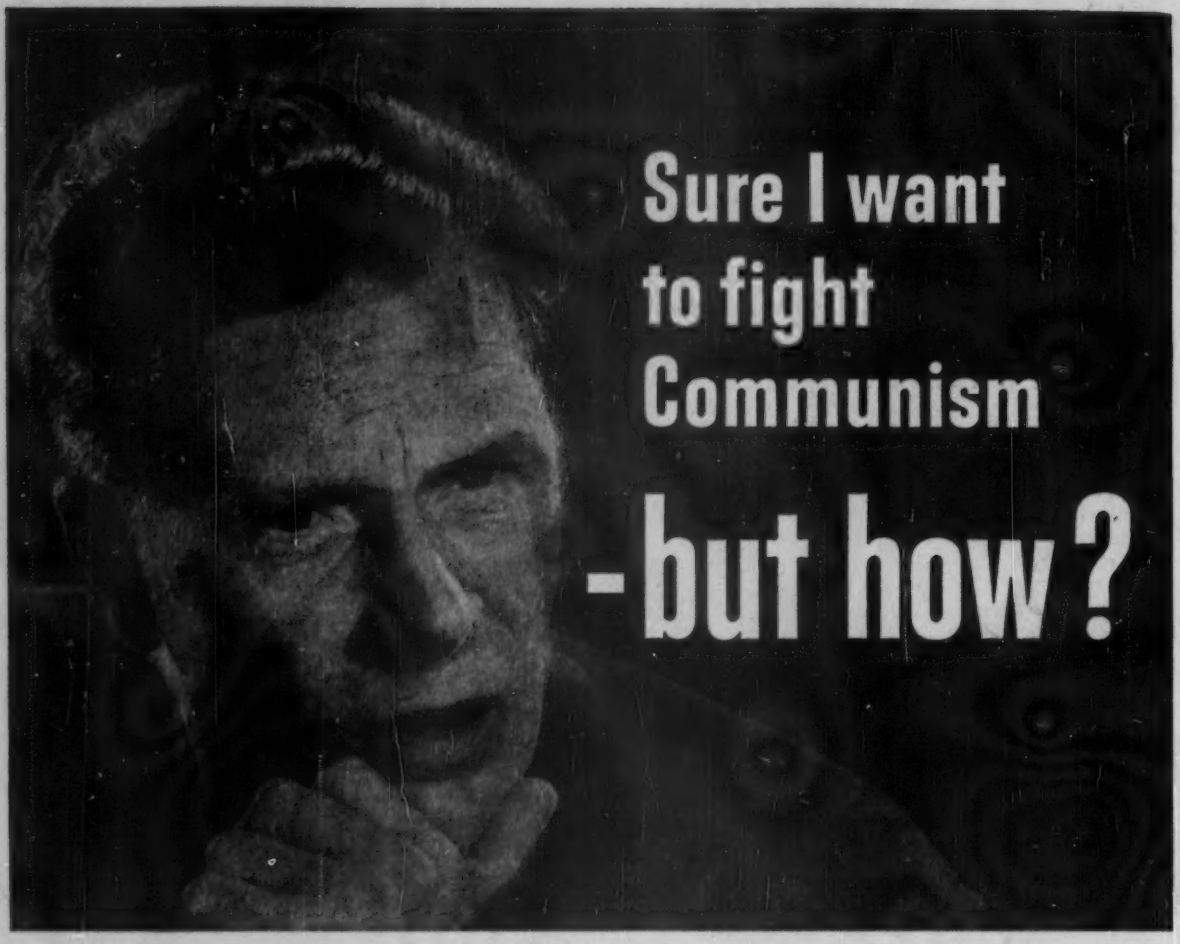

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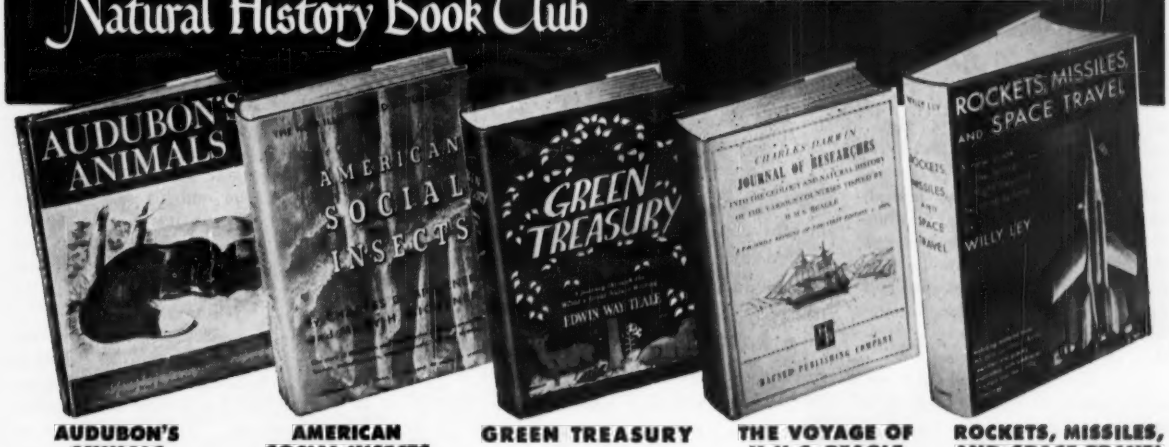

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Nature in Print

By HOWARD ZAHNISER

WHEN Hurricane Hazel whirled through the Washington suburbs and swayed the great oak trees around our house, our eleven-year-old Karen was so excited and energized by this sweeping grandeur of the winds that she wanted to climb one of the tall arbor vitae trees that were wildly tossing on either side of the house's chimney. The impulse, of course, seemed as preposterous as it was inspiring. With our domestic prudence we could only talk of tree climbing in such a storm.

That evening, however, at our after-dinner reading, by the storm-occasioned candle-light, we read John Muir's account of how he actually climbed, in a winter gale, to the top of a Douglas fir and there, as he eloquently wrote, "clung with muscles firm braced, like a bobolink on a reed," while "the slender tops fairly flapped and swished in the passionate torrent, bending and swirling backward and forward, round and round, tracing indescribable combinations of vertical and horizontal curves."

John Muir had not only thought of traveling with a tree top in a storm; *he had done it.*

As it happened, we were reading that windy evening from Edwin Way Teale's recently published volume of John Muir's selections, entitled—and well entitled—*The Wilderness World of John Muir.*

In a section of the book presenting Muir's writings on what Mr. Teale describes as "Forests of the West," we read this account, "Wind-Storm in the Forest," which was first published in *Scribner's Monthly* for November, 1878, almost four years after the experience, and was later made a chapter in Muir's first book, *The Mountains of California*, published in 1894.

Truly it seemed to me that there was a great deal of John Muir represented in the closing paragraphs we read that night:

"We all travel the milky way together, trees and men; but it never occurred to me," wrote Muir, "until this storm-day, while swinging in the wind, that trees are travellers, in the ordinary sense. They make many journeys, not extensive ones, it is true; but our own little journeys, away and back again, are only little more than tree wavings—many of them not so much.

"When the storm began to abate, I dismounted and sauntered down through the calming woods. The storm-tones died away, and turning toward the east, I beheld the countless hosts of the forests hushed and tranquil, towering one above the other on the slopes of the hills like a devout audience. The setting sun filled them with amber light, and seemed to say, while they listened, 'My peace I give unto you.'

"As I gazed on the impressive scene, all the so-called ruin of the storm was forgotten, and never before did these noble woods appear so fresh, so joyous, so immortal."

But, well as Muir's sympathy with wild nature and his eloquence are represented in these sentences, there is a wealth of variety in his writings that occupies a full volume and makes for excellent reading. Arranged as they are in a sequence that adds a sense of continuity, these selections are also introduced by comments, biographical and interpretive, by Mr. Teale, that give the volume's reader a sense of having read a biography as well as a collection of writings. This effect is heightened by the fact that the writings are reports of personal experiences. It was Muir himself who traveled with the tree top in the storm. When, in an account included in this same section, he writes, for example, of the Douglas squirrel's food habits, he introduces his paragraph by commenting, "No other of the Sierra animals of my acquaintance is better fed." His experiences and observations are personal, and the essence of his eloquence is enthusiasm.

In this volume's first section on "Memories of Youth" we have Muir's nostalgic reminiscent accounts of his boyhood in Scotland and his youth on a pioneer farm in Wisconsin. A second section, which Mr. Teale calls "University of the Wilderness," lets Muir tell among other things of his thousand-mile walk to the Gulf of Mexico, and then in a third section, "The Range of Light," a fourth, "The Valley," (Yosemite, of course) and this fifth on the "Forests of the West," more than two dozen selections bring us Muir's living accounts of those great days and years he spent in the Sierra. A dozen more selections—including that best-of-all dog stories, "Stickeen"—represent Muir as a "Glacier Pioneer." And finally, in a seventh section, there are assembled quotations—brief quotations—that represent "The Philosophy of John Muir."

Thus has Mr. Teale presented John Muir and his writings to us, along with an introduction to the volume. This is the best brief essay on Muir of which I know. There is little representation in the book's selections themselves of Muir's great and persuasive writings for conservation, in behalf of what he called "landscape righteousness," as I remember from reading elsewhere. Mr. Teale, however, in his introductory essay well emphasizes Muir's leadership in conservation, and points out that "his finest monument is the wild beauty he called attention to and helped preserve." In closing words that surely the spirit of Muir has inspired, Mr. Teale adds that this is a "beauty, however, that is never entirely safe, beauty that needs as vigilant protection today and tomorrow as it needed yesterday." And he dedicates the volume to "The Sierra Club, The Wilderness Society, The National Parks Association, and all those who are fighting the good fight to preserve what John Muir sought to save."

• • • • • • • •

It is always interesting to read a new account of Henry Thoreau's life, but it has seemed especially so after being refilled with John Muir's wilderness enthusiasm. Edwin Way Teale says that "of those who have written of Nature surpassingly well—Gilbert White, Henry Thoreau, Richard Jefferies, W. H. Hudson—John Muir was the wildest," and there is no quarreling with this dictum. Yet Thoreau, as Mr. Teale would undoubtedly agree, had similarly a clear perception of the worth of wildness. In the same year when the eleven-year-old Muir came to America, Thoreau published his first book, and by the time Muir was entering the peripatetic scholarship in what Mr. Teale calls the "University of the Wilderness," Thoreau had already declared that "in wildness is the preservation of the world" and had made his far-seeing plea for the preservation of wilderness. It would be interesting indeed to study these two great Americans together.

In a volume designed for reading by youths, but one so filled with quotations from Thoreau himself—such an engaging mosaic of quotations, in fact, that I have found it fascinating—Charles Norman has presented Thoreau in his uniqueness as an explorer of Concord and an experimenter in living. *To A Different Drum: The Story of Henry David Thoreau*, he calls his book. But, alas, for some unaccountable reason, Mr. Norman has said nothing at all of those great wilderness trips that are so well described in Thoreau's book called *The Maine Woods*. He thus misses what would seem to be an experience of special appeal to young readers, and fails to arrive at what seems to me one of Thoreau's greatest perceptions—his sensitiveness to our modern need for what he

Vole Disclosed

By AUGUST DERLETH

Pushing back new-fallen snow,
the shovel showed a vole below.
He had been busy burrowing there
when suddenly exposed to sunny air.
After one startled moment, he turned back
and frantically tried to find his track;
and, finding it, dug under, disappeared —
only his mark was left in snow I'd cleared.

I felt a twinge of sympathy for that dark vole
gone back safe into his small white hole.
The way the world of men's made up these days,
a lot has changed in human ways;
man knows no more than mouse
when someone might lift the roof
off his house.

called the "tonic of wildness." When Mr. Norman has an opportunity to prepare a new edition of his work one can hope that he will first accompany Thoreau through his essay on "Walking," and on his excursions to the Maine woods.

William Condry in a 112-page excellent brief biography, which also has been recently published, remarks that "of all the trips he describes, the one to the forest wilds of Maine and Mount Katahdin shows Thoreau at his best." So, I have especially enjoyed Mr. Condry's guidance in once more reliving some of Thoreau's life—what can come into such a book—and I have agreed with him, as he writes on his last page, that "for whatever reason different readers admire him, Thoreau will be remembered by most as the advocate of living close to nature." And Mr. Condry continues:

"No one has ever put the case better than he did in *Walden*: 'Our village life would stagnate if it were not for the unexplored forests and meadows which surround it. We need the tonic of wildness—to wade sometimes in marshes where the bittern and the meadow-hen lurk, and hear the booming of the snipe, to smell the whispering sedge where only some wilder and more solitary fowl builds her nest, and the mink crawls with its belly close to the ground. At the same time that we are earnest to explore and learn all things, we require that all things be mysterious and unexplorable, that land and sea be infinitely wild, unsurveyed, and unfathomed by us because unfathomable. We can never have enough of Nature.' "

How closely Muir, in the magnificent splendors of the Sierra, came to the same persuasion, exclaiming: "In God's wildness lies the hope of the world—the great, fresh, unblighted, unredeemed wilderness;" insisting that "there is a love of wild nature in everybody;" urging all to "climb the mountains and get their good tidings;" shouting, as it were, from a swaying tree-top in a loud storm the same wisdom that Thoreau pondered in a forest silence so profound that he could hear a distant tree fall—and marvel.

If Muir is our prophet of the wilderness—and he is—Thoreau is our philosopher of wildness. We honor them both, and thank those whose books bring us anew the influence of their greatness.

The Wilderness World of John Muir: With an Introduction and Interpretive Comments. By Edwin Way Teale. Boston: Houghton Mifflin Company. 1954. 332 pp. (5-5/8 by 8-3/8 in.), with 8 full-page drawings by Henry Bugbee Kane and index. $4.50.

Thoreau. By William Condry. New York: Philosophical Library. 1954. 114 pp. (5-3/8 by 8 in.), with list of Thoreau's writings. $3.50.

To a Different Drum: The Story of Henry David Thoreau By Charles Norman. New York: Harper Brothers. 1954. 113 pp. (5-5/8 by 8½ in.), with 6 drawings by Margaret Bloy Graham.

Redouté's Roses

Pierre-Joseph Redouté Roses. Selected and introduced by Eva Mannering. New York. 1954. The British Book Centre. Illustrated by 24 plates in full color by Redouté. $8.50.

Redouté was the most prolific and popular of botanical artists during a long life that ended in 1840, when he was eighty. As illustrator of botanical books, he drew and painted plants of wide variety, but he loved most roses and lilies. These he painted in beautiful and meticulous detail, and the results were published in his *Les Lilacees* and *Les Roses.* For this republication Miss Mannering has chosen twenty-four of the original rose plates, here presented in large size and full color, following her introduction and brief descriptive text for each rose in French. This, indeed, is a lovely book.

Briefly Noted

Treasury of Philosophy. Edited by Dagobert D. Runes. New York. 1954. The Philosophical Library. 1280 pages. $15.00. This is a truly monumental collection of writings on philosophy by many great thinkers, East and West.

180 Games for One Player. By J. B. Pick. New York. 1954. Philosophical Library. 137 pages. $3.75. The title is descriptive and the games are of wide variety, not just card games.

Fifty Years in Alaska. By Carl J. Lomen. New York. 1954. David McKay Company. 302 pages. $4.00. The story of Alaska by a man who has grown up with the Territory.

Sailing Aerodynamics. By John Morwood. New York. 1954. Philosophical Library. 123 pages. $7.50. The theory of sailing for the yachtsman.

Soil. By G. V. Jacks. New York. 1954. Philosophical Library. 221 pages. Illustrated. $5.00. A study of and report on soil by the director of the Commonwealth Bureau of Soil Science, Rothamsted, England.

Dictionary of Last Words. Compiled by Edward S. Lecomte. New York. 1955. Philosophical Library. 267 pages. $5.00. Compilation of the final thoughts and words of a wide variety of individuals.

White Mane. By Albert Lamorisse. New York. 1954. E. P. Dutton and Co. $2.75. Collection of fine pictures from the film "White Mane."

Horses Across the Ages. By Jeanne Mellin. New York. 1954. E. P. Dutton Co. 91 pages. Illustrated by the author. The story of horses as woven into the history of man.

The First Book of Prehistoric Animals. By Alice Dickinson. New York. 1954. Franklin Watts, Inc. 92 pages. Illustrated by Helen Carter. $1.75. Another in this publisher's interesting series of "First Books," which introduce the younger reader effectively to a basic knowledge of Nature.

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Bulletins

Among the recent bulletins received are several that may be of interest to some of our readers. . ."Crops for Emergency Planting" by W. O. Scott discusses crops that may be planted when flood, insects, winterkill or other hazards destroy other crops. "Growing Birdsfoot Trefoil in Illinois" by J. J. Pierre and J. A. Jackobs discusses this perennial and drouth-resistant legume. Both are publications of the University of Illinois College of Agriculture at Urbana. . ."Waterfowl of Lake Merritt" describes the waterfowl sanctuary in Oakland, California, and is published by the Oakland Park Department, 634 14th St., Oakland. . . "White-tailed Deer Populations in Illinois" by Lysle R. Pietsch is published by the Natural History Survey Division, Urbana, Illinois. . ."Guide to Popular Floras of the United States and Alaska" is an annotated, selected list of nontechnical works for the identification of flowers, ferns and trees and has been compiled by S. F. Blake. It is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. for 25 cents. . ."Limestone" by C. M. Linsley tells how, when and where to use limestone and is Circular 721 of the University of Illinois, College of Agriculture, Urbana. . ."The Parade of Modern Roses and Perennials" is the always colorful and alluring catalog of Jackson and Perkins Co., Newark, New York. . ."The Cornell Plantations", Volume X, No. 4, Summer, 1954, features articles on Venus fly-trap, farm living and Death Valley. One dollar a year. Bristow Adams, 112 Roberts Hall, Cornell University, Ithaca, New York, is editor. This is an always interesting publication worthy of regular reading and saving for reference.

Four leaflets in the series on American Woods have been revised by the U. S. Forest Service and are available at five cents each from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. These are titled "Eastern White Pine," "Western White Pine," "Western Redcedar," and "Yellow-Poplar." . . . "Operation Wildlife Research" by Cyril Kabat and Ruth L. Hine is a popular discussion of the reasons for and the procedures in wildlife research. It is a publication of the Game Management Division of the Wisconsin Conservation Department, Madison 1, Wisconsin . . . "Biology and Control of the Engelmann Spruce Beetle in Colorado" by C. L. Massey and N. D. Wygant is Circular No. 944 of the U. S. Forest Service and is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for 20 cents . . . "Southwestern Ohio Check List" is compiled from *Birds of Southwestern Ohio* by Kemsies and Randle, and is available for five cents plus postage from Myron G. Johnson, Jr., 2224 Raeburn Drive, Cincinnati 23, Ohio.

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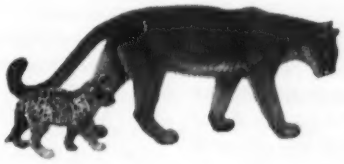

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City .....Zone.....State.....

More Tree Towns

At the end of his little compilation of the names of communities bearing the names of trees on their postmarks, Harry Githens suggested that readers might be able to add to the list. They have. From High Point, N.C., Allen R. Seifert writes to call to our attention the communities of MAGNOLIA, New Jersey, and SPRUCE PINE, North Carolina. . .J. Murray Hollister of Swampscott, Mass., suggests that we should add to the list JOSHUA TREE, California, and TWENTYNINE PALMS, in the same State. . .One who identifies himself only as "A Reader" writes to tell us that there is a town near Gary, Indiana, called BLACK OAK. . .E. M. Dahlberg of Ladysmith, Wisconsin, a nurseryman and conservationist, writes that Wisconsin has been short-changed on the Githens' list, for BUTTERNUT, ARBOR VITAE, HAWTHORNE, BASSWOOD and ROCK ELM were overlooked. Also BIRCHWOOD and ELMWOOD seem entitled to addition. They are all Badger State towns. Mr. Dahlberg also points out that there are many communities in Wisconsin that have "wood," or "grove," or "forest," or include a tree, in their names, like CEDARBURG, OAK FIELD, OAK HILL, HICKORY CORNERS, PLUM CITY and BALSAM LAKE. Mr. Dahlberg found all these with a hand lens and a State road map.

Harry Laurent, Nashville, Michigan, writes to add to the list the town of SYCAMORE, Ohio, near Tiffin. . .M.H. Gysling of Gobles, Michigan, suggests that we overlooked such woody communities as HAWTHORNE, New York; LINDEN, New Jersey; LAUREL, Maryland; LOCUST VALLEY, New York; MAPLEWOOD, New Jersey; LARCHMONT, New York; BRIARCLIFF, New York; CEDAR RAPIDS, Iowa; ELMHURST, New York; OAKLAND, California and New Jersey; POPLAR BLUFF, Missouri; PINE BLUFF, Arkansas; PINE GROVE, Michigan; PINEHURST, North Carolina; WILLOW GROVE, Pennsylvania; OAK RIDGE, Tennessee; TWIN OAKS, Michigan. . .Mabel C. Satterthwaite of Salem, Ohio, adds ASPEN and LIME, Colorado; ORANGE, California, Connecticut, Texas and Wyoming; OSAGE, Iowa, Minnesota, New Jersey and Oklahoma; PINE TREE, Wyoming; PAW PAW, Illinois; RED ELM, South Dakota; TUPELO, Mississippi and Oklahoma; WHITE PINE, Montana; BURR OAK, Iowa and Oklahoma; BIRCH TREE, Mississippi. Her bright eyes find that Arizona and Colorado also have towns named BUCKEYE; Kansas has its CEDAR; Alabama, Arizona, Minnesota, Oklahoma and Kansas have COTTONWOOD; Nevada, New Jersey and Alabama, HAWTHORNE; Michigan, HOLLY; Indiana and Michigan, HEMLOCK; Florida, LIVE OAK; Indiana and Montana, LAUREL; North Dakota, MAGNOLIA; Indiana, MULBERRY; Montana, OLIVE; Colorado, PINE; Georgia, Iowa and Oklahoma, RED OAK; Alabama, Georgia and Ohio, SYCAMORE; Kansas, WALNUT; Alabama, YELLOW PINE. . .Irma Choyce of Glen Ellyn, Illinois, also calls our attention to the fact that there is a RED OAK in Iowa.

Mrs. D. S. Teters of Bryan, Ohio, adds ASH and SYCAMORE, Ohio, and LAUREL, ORANGE and MULBERRY, Indiana. . .J. H. Watson of Nora Springs, Iowa, adds BEECH, LAUREL, LINDEN, MAGNOLIA and WALNUT to the tree towns in his State. . .Herbert A. Inkenberry of Mattoon, Illinois, calls our attention to BURR OAK, CEDAR, SYCAMORE and MULBERRY, all in his native Kansas. . .H. Herbert Johnson, Professor of Biology at The City College, N.Y., points to the tiny settlement of TREE, Georgia, in Towns County. He also has spotted tree communities called to our attention by others. We get spots before our eyes when we try to check which towns have been added, so we will credit Dr. Johnson with such Georgia communities as PALMETTO, RED OAK, WHITE OAK, SYCAMORE, PERSIMMON, REDBUD, PINELOG, SUMACH, as well as SYCAMORE, South Carolina, MAGNOLIA, New Jersey and HICKORY, North Carolina. . .Mrs. George M. Merriken of San Diego adds quite a number of California communities, many of them with a tree as a part of the name, but including also HEMLOCK, JASMINE, LILAC, MADRONE, MANZANITA, PEPPERWOOD, SUGAR PINE and LAUREL.

All this is not, of course, of earth-shaking importance, and we have to stop somewhere in adding to the list of "Tree Towns." So, thanking all who were kind enough to be interested to contribute, we will settle for the towns above.

Briefly Noted

Planting the Southern Pines. By Philip C. Wakeley. Washington, D. C. 1954. Superintendent of Documents, U. S. Government Printing Office. 233 pages. Illustrated. $2.75. The challenge of restoring the forest land to southern pine production in the interest of the southern and national economy.

Grignard Reactions of Nonmetallic Substances. By M. S. Kharasch and Otto Reinmuth. New York. 1954. Prentice-Hall. 1384 pages. $15.00. Highly technical work for the organic chemist.

The Hidden Life of Flowers. By J. M. Guilcher. New York. 1954. Philosophical Library. 93 pages. Photographs by R. H. Noailles. $4.75. The story of the birth of plants, largely in picture.

The Solitary Blackbird. By E. Clephan Palmer. New York. 1954. Vanguard Press. 61 pages. $2.00. Interesting and remarkable personal experiences of a family and a blackbird.

Life on Other Worlds. By Sir Harold Spencer Jones. New York. 1954. Macmillan. 259 pages. Illustrated. $3.00. Discussion of the possibilities of life on other planets by the Astronomer Royal.

Alone to Everest. By Earl Denman. New York. 1954. Coward-McCann. 255 pages. Illustrated. $3.75. The story of the author's mountaineering exploits in Africa, culminating with his forbidden journey in 1947 through Tibet to Everest.

Modern Science and God. By P. J. McLaughlin. New York. 1954. Philosophical Library. 89 pages. $2.75. A new translation of the Papal Allocution to the Pontifical Academy of Science on November 22, 1951.

Hugh Roy Cullen. By Ed Kilman and Theon Wright. New York. 1954. Prentice-Hall. 376 pages. Illustrated. $4.00. This is a story of American opportunity as exemplified by the life of Hugh Cullen, Texas oil millionaire and philanthropist.

Pete the Parrakeet. By Irma Simonton Black. New York. 1954. Holiday House. 97 pages. Illustrated by Kurt Werth. $2.50. A story for the younger reader about a personable parrakeet.

Tree Frog. By Paul McCutcheon Sears. New York. 1954. Holiday House. Illustrated by Barbara Latham. 46 pages. $2.00. Story of the tree frog and its life. For the younger audience.

Care of the Aging Dog. By C. E. DeCamp. Fond du Lac, Wisconsin, 1954. All-Pets Books, Inc. 64 pages. Illustrated. $1.25. Sound advice on canine geriatrics.

Pet Collie. By Ted Kattell. Fond du Lac, Wisconsin. 1954. All-Pets Books, Inc. 64 pages. $1.25. Care of the collie, puppy and adult.

Elements of Ecology. By George L. Clarke. New York. 1954. John Wiley and Sons. 534 pages. Illustrated. $7.50. A unified treatment of the fundamental concepts of ecology—the basic relations between organisms and the factors in their environment.

Indian Campfire Tales. By Efren Reveles. New York. 1954. Exposition Press, Inc. 99 pages. Illustrated. $3.00. Authentic Indian legends by one who has worked with Apaches, Zunis, Hopis, Navajos and Mission Indians.

The Art of Primitive Peoples. By J. T. Hooper and C. A. Burland. New York. 1954. Philosophical Library. 168 pages. Illustrated. $7.50. Popular presentation of primitive art in various parts of the world.

The Pruning Manual. By Everett P. Christopher. New York. 1954. The Macmillan Company. 320 pages. Illustrated. $5.00. Practical advice and instruction on the pruning of trees, plants, vines and the like.

The Odyssey of an Animal Collector. By Cecil S. Webb. New York. 1954. Longmans, Green and Co. 368 pages. Illustrated. $6.50. The superintendent of the Dublin Zoo writes of his personal experiences.

Contents Noted

DESPITE the fact that the only recompense is the honor, ninety-three designs were submitted by sixty-six artists in the contest for the design to appear on the 1955-56 Migratory Bird Hunting Stamp, or "duck stamp." We were among those invited to serve as a judge in making the selection. The judging is completely impartial for there is no clue as to the artist, and each judge votes secretly for his first, second and third choices. For this year a black and white, opaque watercolor showing three blue geese in flight was the successful design. It is the work of Stanley Stearns of Binghampton, New York. Although our second choice placed third, and our third choice was not "in the money," we were pleased that the blue goose design headed our list. In fact, there were a number of blue goose pictures entered, several of them excellent, so Mr. Stearns may congratulate himself on having won against stiff competition. This will be the twenty-second stamp in this series. The stamps are required of all duck hunters and must be affixed to their licenses. but they have considerable interest, also, to philatelists.

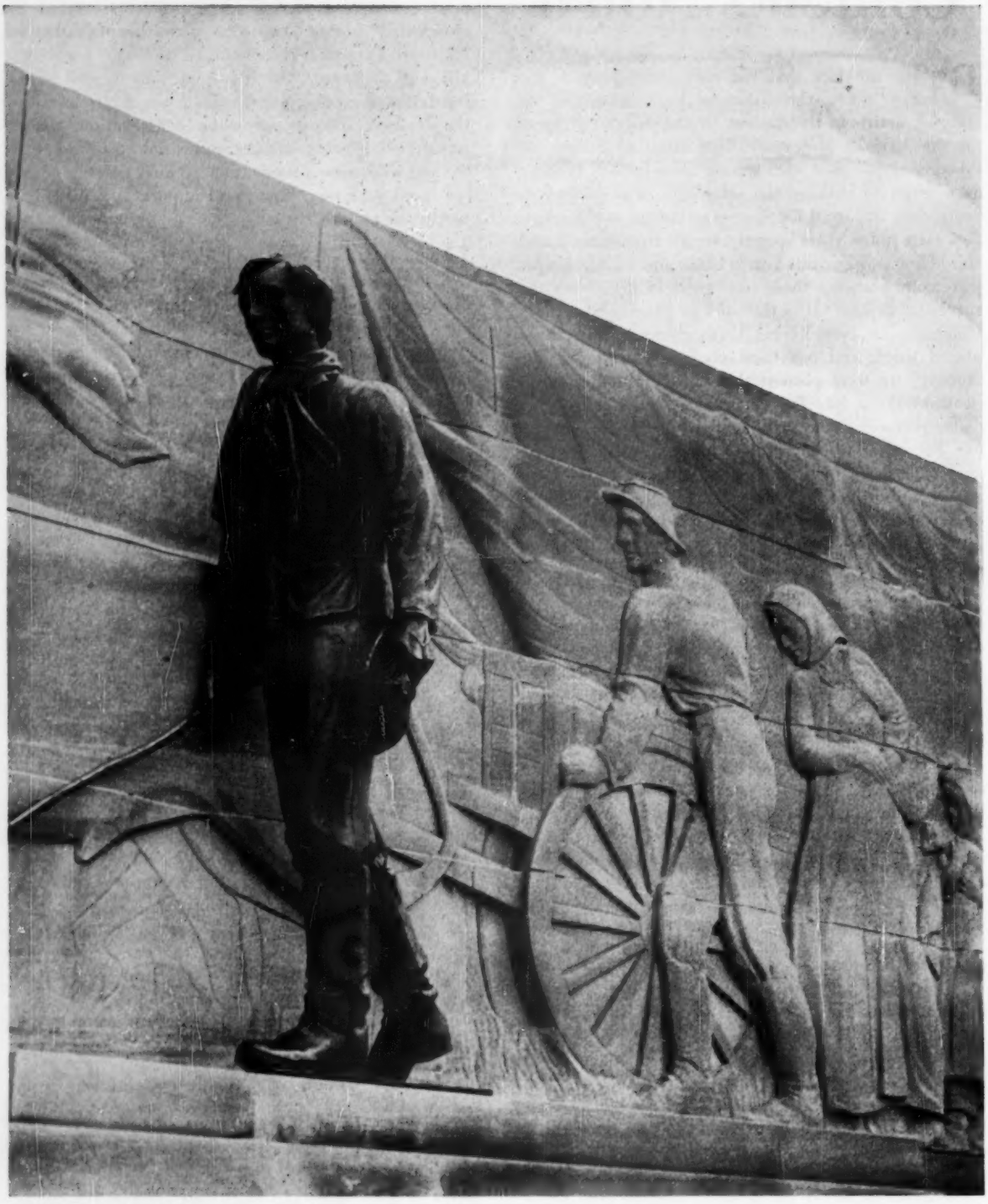
WHEELING into action in anticipation of renewed and vigorous effort to include construction of Echo Park Dam, in Dinosaur National Monument, as a part of a Congressionally approved development of the upper Colorado River, is the Council of Conservationists. This Council has been formed to coordinate the efforts of some fifty conservation groups in defending the Monument from invasion. The strength of the conservation viewpoint prevented action in favor of Echo Park Dam by the past Congress. The executive committee of the Council is headed by Fred Smith of New York, and includes Roy Provins of New York, Howard Zahniser, Anthony Smith and Ira Gabrielson of Washington, D. C., Joe Penfold of Denver, and David Brower of San Francisco. Headquarters are at 161 East 42nd Street, New York 17, New York.

CONSERVATIONISTS hope that progress will be made by the new Congress in solving a number of pressing problems affecting our land and wildlife resources. It is hoped that legislation will be enacted applying a percentage of the income of the U.S. Forest Service to meet the need for funds to administer and develop the recreational and wildlife uses of the National Forests. Legislation is also sought to accelerate the acquisition of areas for waterfowl nesting and wintering, thus rounding out the National Wildlife Refuge system. In that connection, effort will be made to check indiscriminate drainage of areas suitable for waterfowl, and to obtain for practical and research use the accumulated surplus of money built up under the provisions of the Pittman-Robertson Act, but not yet appropriated. Provisions of the Water Pollution Control Act expire with the Act in 1956 unless steps are taken to continue it, and this will be a concern of conservationists at this new session of Congress. The problems created by antiquated mining laws that permit exploitation of National Forests require solution through drastic revision of the laws. Also it is important to spell out in legislation the principles involving the multiple use of the National Forests for water conservation, timber production, grazing, mining, recreation, fish and wildlife and wilderness preservation. Thus conservationists are faced with busy times and important responsibilities in the public interest.

REFERRING again to Echo Park Dam, it is interesting to recall that last spring Secretary of the Interior McKay ridiculed the claim that this dam would be a precedent and a threat to other National Parks. No one is going to build a dam in Yosemite, for example, he said. Now we find that the Merced Irrigation District of California has revived plans for a hydroelectric power project on the south fork of the Merced River. This would flood a portion of Yosemite National Park. Engineers of the district are quoted as saying: "Sure we know the area is in a national park, but that is a political question. It's a good location for a dam and it is simply up to the people of the United States to decide whether they prefer to keep their park or permit us to use this source of additional revenue for the irrigation district." If the American people accept the thesis that what happens to our National Parks is "a political question" then our incomparable National Park System is doomed. Such an attitude favoring exploitation of these areas is being boldly voiced these days, and it is the direct descendant of the precedents that Secretary McKay regards as of no consequence.

WE ARE happy to congratulate Secretary McKay on backing up the National Park Service in opposing a project to erect a permanent ski lift in Mt. Rainier National Park. This threat was the subject of extensive hearings by Director Conrad Wirth in Washington State, and the text of our October, 1954, editorial. The erection of a permanent structure would have been an inexcusable invasion of the Park. Now the program permits installation of ski tows, supposedly unobtrusive when the winter sports season is over. Even so, their installation constitutes a debatable development in a National Park.

NATIONAL Wildlife Week will be observed from March 20-26, announces the National Wildlife Federation. This year the educational emphasis during this week will be on activities to "halt the drainage madness that threatens to destroy the continental flocks of wild ducks and geese and other irreplaceable natural resources." It is pointed out that an original wetland acreage of some 120 million acres has now been reduced to less than 30 million acres. Drainage, water pollution and man-induced drought have destroyed 90 million acres. This certainly provides a strong theme for the 1955 campaign. R.W.W.



Detail of the memorial to the Lincoln family that stands on the Illinois shore across the river from Vincennes and that marks the route of the Lincolns to Illinois.

PHOTOGRAPH BY BARRY MURRAY

The buffalo traveled its ancestral routes from south to north and back again year after year.

The Buffalo Trace

By VIRGINIA S. EIFERT

Photographs by the Author

"THAT'S *my* trail—the Wilderness Road," declared Daniel Boone. "If it hadn't been for me, hardly anybody would have got to Kaintucky. Yes, it's my road; I laid it out, and there been thousands followin' me ever since!"

Daniel Boone may have taken a good deal of credit for laying out the Wilderness Road in Kentucky, especially that part of it called Boone's Trace, but other men had preceded him into the wild land of Kentucky—Walker and Finley, and the Indians before them. They found a trail laid out for them long before Daniel came along with his ax and gun and chopped a way through the laurels, and blazed trees for the thousands of people who followed him.

"Well, yes, I agree, *'t was* the buffalo that laid out that trail first," admitted Dan Boone, fingering his long Kentucky rifle. "They come before white men *or* Injuns, and cut themselves a path through Kaintucky all the way to the Ohio, and, I hear tell, they went right on through the wilderness beyond, maybe as far as the Mississippi!"

What Dan Boone likely did not know was that, long before men, the great herds of bison, or buffalo, had been traveling their ancestral routes from the south to the north, and back again, each year. Going and coming with the changing of the seasons, with the winter's browning and the spring's greening of the grazing lands, the huge creatures trod out roads. A certain long buffalo path, cut slantwise across four states, was one of the oldest roads in America and one of the most heavily traveled, both by the feet of animals and the feet of men. This was the Buffalo Trace, one part of which Dan Boone knew well. So did Abraham and Bathsheba Lincoln and their five children. Lucy Hanks and her baby, Nancy, knew it, too. Considerably later, another Abraham Lincoln knew another part of the old trail.

Buffalo traveled fast and in great herds. As they went, their cloven hoofs trampled the muddy trail so hard that it stayed trampled and dried that way, in winter and in summer, the imprint lasting long after the herds themselves were gone. The trail hit the high places and stayed away from the wet lowlands, except where there were wallows. In the marshes the vast tonnage of thousands of buffalo could sink and be lost in the mud, just as the mammoths and mastodons had been lost in the Kentucky salt licks long before. It was these huge, whitened bones that the buffalo nudged about in search of more salt beneath them.

When the Indians ventured into the mysterious wilderness that was Kentucky, a land no tribe called its own, they learned to follow the buffalo roads instead of laboriously blazing trails of their own through the wild forests, the cane thickets, and the laurel jungles. It was a great convenience to be able to travel in the footprints of the herds. For a distance of some fifty miles through Kentucky, the Warriors' Path, connecting the Shawnee villages in Ohio with the Cherokee settlements in North Carolina and Tennessee, followed the route of the Buffalo Trace.

Pioneers traveling the Buffalo Trace forded rocky, white-water streams tumbling down from the hills.

Where the present states of Kentucky, Tennessee, and Virginia come together, at a point at the base of the Cumberland Mountains, there is a lower place in the tremendous wall of rock that shuts Kentucky away from the East. At no other spot could men and animals cross as easily as they could at Cumberland Gap. It was not an easy crossing, however, for the steep climb over the Gap often killed the weak or discouraged the strong. But the buffalo had found it, and in dark hordes had climbed up and over the rocks, had paused, panting and blowing through big wet nostrils when they reached the top, and, with the smell of water coming to them from the valley, thundered down the more gentle slant into Kentucky, where Yellow Creek and the Cumberland River lay waiting for them. To all who could follow, the Buffalo Trace held out a beckoning hand, moved northward through Kentucky, crossed the Ohio between Louisville and New Albany, slanted across Indiana, crossed the Wabash at Vincennes, and cut straight across the level lands of Illinois, through the waving turkey-foot grass and the Spartina plumes of the wet prairie, to the Mississippi near St. Louis.

Buffalo . . . Indians . . . pioneers. Of them all, there were perhaps no travelers on the Buffalo Trace more determined than the pioneers, nor any others more beset with dangers undaunting to their bullheaded determination. Dr. Thomas Walker, in 1750, was one of the first white men to enter Kentucky, and it was not long after that when Daniel Boone and John Finley followed and fell so deeply in love with its wilderness that Boone, at least, was never quite the same again.

"No," said Dan, "a fellow can't fight his way into and through and out of a wilderness like Kaintucky without bein' mightily changed by it I know, some men hated it and they never went back again. I never blamed 'em, even though I couldn't agree. The Injuns got a lot of folk—Injuns were bad in them days. But me, I couldn't stay away. I'd come back to my cabin on the Yadkin in North Carolina and I tried to live proper with my family, but I couldn't seem to forget that pretty country up there, just waitin' for me to make somethin' of it."

His chance came at last. Under Colonel Richard Henderson and for the Transylvania Company, Dan Boone was hired to help cut a trail through the wilderness of Kentucky, in those days still a county of Virginia. He and thirty men chopped through laurel

"The trail slanted across Indiana and crossed the Wabash at Vincennes." Clark Memorial at the ancient crossing of men and animals at Vincennes, Indiana.

Dan Boone did not build a road—for twenty years the Wilderness Road was not wide enough in most places for a wagon.

thickets and through cane tangles. They cleared a path up and down hills, amid pines and hemlocks under which grew slim white violets and arbutus in spring. The party located the best fords, and whenever they could they followed the wanderings of the buffalo road. For fifty miles above the Gap they followed the Warriors' Path and the Buffalo Trace, then found a buffalo trail that took them westward to the Rock Castle River, up Roundstone Creek, through the Gap in Big Hill and down along Otter Creek to meet the yellow waters of the Kentucky River.

"And here 'twas I built Boonesborough," said Dan Boone proudly. "And if Jim Harrod, that old buzzard, hadn't built his Fort Harrod when he did, sneakin' in ahead of me, I'd have had the first settlement in Kaintucky to my credit, that I would!"

Yes, Boone was not the only man bent on settling Kentucky. It was true that part of Boone's Trace was well known to other hunters and explorers, although it was he who actually marked it for others to follow. That same year, 1775, another trail blazer followed Boone. But at the point on the Rock Castle where Boone's Trace went to the right, Ben Logan and his men went on in a northwesterly direction all the way, via the buffalo trail, all the way to the Ohio at Louisville. Eventually it was Logan's Trace that became known in its entirety as the Wilderness Road, but it was always thought of as Boone's Wilderness Road, even though the majority of people followed the left-hand fork toward the Ohio instead of the right-hand fork to Boonesborough.

Dan Boone did not build a road; he only cut a trail. Consequently, for twenty years the Wilderness "Road" was not wide enough in most places for a wagon, except on stretches of the old Buffalo Trace, yet during that time a hundred thousand people traveled the trail and brought household goods, printing presses, livestock, everything they could carry on horseback or on human backs, to build the settlements of Kentucky. They were determined to come, and no one could keep back the great push of humanity, not even the Indians.

For in spite of hopeful pioneers and the urging of men like Boone, the Buffalo Trace and the Wilderness Road were lonely highways in days when it was dangerous to go into this bloody land. Usually travelers gathered at various blockhouses and way stations in Tennessee and Virginia. There they waited until sufficient numbers had arrived with ample arms and ammunition to make a safe journey into Indian country. And the Indians were angry

"They cleared a path up and down hills, under pines and hemlocks beneath which grew slim white violets."

in the 1780's. They resented white men invading their private hunting grounds, and, besides, their anger was inflamed by the British, who were paying them to attack mid-western white settlements as one of the back-country stratagems of the Revolutionary War.

Yet even in the face of violent deaths inflicted by Indians upon hundreds of people along the Buffalo Trace, they continued to come. It was the gateway of the calling West, not only in Kentucky but in territory beyond. Sometimes it took a family more than one generation to reach a goal unattained by the original family that left Virginia with hopes of making a fortune—somewhere, somehow. One of these was the first Abraham Lincoln, grandfather of our Abraham Lincoln, who sold his prosperous farm in Virginia, on the advice of the persuasive Dan Boone, and brought his wife and five young children over the rigors and dangers of Cumberland Gap, the Buffalo Trace, and the Wilderness Road into Kentucky. He was a young man of 32, and he had willingly given up a life of comfort in Virginia for a life of hardship and danger in Kentucky. Here, four years later, he was killed by an Indian. And his youngest son, eight-year-old Tommy, who was with his father when he was murdered, grew up to be the Thomas Lincoln whose second child he named after his father—Abraham.

Foam flower, one of the spring blossoms that appears along stretches of the old Wilderness Road and the Buffalo Trace in Kentucky and Virginia.

Tom owned land in Kentucky, but always in the Lincolns there was an urge to go somewhere else, and once more a family of Lincolns set out on a journey to greener lands. They ferried over the Ohio, downstream from the spot where the old Buffalo Trace crossed, and lived for fourteen years in Indiana near where the Trace slanted toward Vincennes. And then it was, in 1830, that again the Lincolns started off once more upon the ancient highway of the buffalo. There were thirteen people in the party, for when a Lincoln decided to move, all his kinfolk in the vicinity moved, too. Young Abe was 21, tall and lank and eager to see new lands. He helped load the ramshackle wagons, helped guide the straining oxen through the muddy road, which was scarcely improved over the days when the buffalo went that way. The party crossed on the ferry from Vincennes to Illinois, where the Trace crossed, and followed it for several miles through Purgatory Bottom, then turned northwest and eventually came to the land near Decatur, where the Lincolns built another cabin.

Many years later a log road was laid on the muddy floor of the Buffalo Trace in Illinois. The swamps were partially drained. Much later it became a paved highway that went through Lawrenceville due west to East St. Louis on the old route of the buffalo from Virginia, and is known today as U.S. Route 50. Down in Kentucky, the Buffalo Trace and the Wilderness Road are followed almost exactly in many places by Routes U.S. 150 from Louisville to Mount Vernon, and 25E to and over Cumberland Gap. In other places, the railroad follows part of the old path. In Indiana the route is less well defined, and is lost in many places, all but the crossing at Vincennes, which is marked by a big bridge and a memorial to all who used that spot as a crossing of the river.

The buffalo are gone, and so are Dan Boone and John Finley and the two Abraham Lincolns, but the marks they laid on the face of American earth is indelibly preserved by the highways of concrete and rails of steel that replace the hard-packed, blood-stained paths and the torturous trails of the wilderness.

Content

By MARY FRANKLIN

The moon is shot with gold tonight,
With platimum aglow.
It nestles in the nearest pine,
Benignantly bends low.
Why should I wish upon a star,
A diamond distant, cold?
What need of childhood's rhymes? Tonight
The moon is mine to hold.

River pollution and hot weather killed these spring-spawned shad in the Anacostia River, which enters the Potomac in the national capital. The combination of these two factors so reduced the oxygen content of the river water that the fishes could no longer survive. Elimination of pollution would do away with the most lethal factor in the destruction of the fishes.

PHOTOGRAPH BY CHARLES DEL VECCHIO, COURTESY OF THE WASHINGTON POST AND TIMES-HERALD.

TV and Potomac Pollution

By E. JOHN LONG

ALMOST anyone will agree that the Potomac is among the most beautiful rivers in the world. And one of its loveliest reaches flows past the monumental buildings and memorials of Washington, the National Capital. Along much of this stretch tree-shaded lawns slope smooth and green down to the stone walls that define the river's banks.

It was the natural beauty of the lagoons and lake-like expanse of the Potomac itself that prompted George Washington to recommend that the seat of government be built at this place. It is still pretty on the picture postals that visitors send to the folks back home.

But closeup? Phew! And in a testtube? Wow!

Let us face it, the plain unvarnished truth is that the Potomac, right where it passes one of the cleanest and prettiest cities in the world, is a filthy, dangerous stream that is not safe for drinking, bathing, fishing, or even boating. Its waters are lethal to various forms of wildlife.

Not the least tragic aspect of the Potomac pollution problem is the wholesale destruction of food and game fish. Once the Washington area was a paradise for disciples of Izaak Walton. In Colonial days shad and herring were so abundant that plantation owners, including George Washington, caught them in nets and used the fish for fertilizer as well as food. Records show that more than 100 varieties of fish—including black and striped bass, trout, pickerel, rockfish and shad—have been taken from the waters of Washington's harbor. Some of these are still found in lessened numbers, indicating that they could be restored if pollution were removed. Through man's indifference and neglect, the Potomac at Washington has become little more than an open sewer, perhaps the deadliest of America's rivers!

This is a serious situation when one considers that a few miles above Washington the Potomac is clean enough to provide most of the drinking water used by the National Capital. And, in its lower reaches, the river manages to purify itself long before it reaches Chesapeake Bay.

Why should things be so bad in the Washington area, within sight of the headquarters of the U.S. Public Health Service and other leading sanitation agencies that are carrying America's message of health and cleanliness to the ends of the earth?

In all fairness to the health authorities, it should be stated that they are aware of the seriousness of the situation, and have striven long and earnestly to obtain the legislation and funds needed for a real cleanup. Some commendable progress has been made in recent years, including the installation of enlarged sewage treatment plants, new storm sewers, ejector stations, and gravity sewer and force mains.

But Washington, and its suburbs in Maryland and Virginia, have been growing, since the 1930s, like the

Once the Potomac was safe for swimming, as this photograph from the files of the Library of Congress indicates. Here is a bathing beauty contest at the bath houses and beach on the Tidal Basin in 1922.

proverbial bad weed. Necessary facilities of all kinds have simply not been able to keep pace. Sewage, not being a pleasant subject, seldom gets its due share of attention anywhere. In voteless Washington it probably gets far less. At any rate, few people noticed that, when appropriations were not forthcoming, sanitary engineers had to take the only course open to them—dump untreated sewage into the nearest waterway, and hope that the current would carry it away.

Unfortunately the city of Washington lies at the head of tidewater. The Potomac, which is a rushing stream until it reaches the edge of the District, is here a sluggish expanse that is backed up twice a day by tides rolling up from the Chesapeake. As a result most of the river at its doorstep just sloshes around. When the river is low, a drop of Potomac River water requires 41 days to progress from Key Bridge to Fort Washington, a mere eight miles.

Consequently a drop of Potomac river water can get pretty stale. Add raw sewage and soon every drop is loaded! Scientists recently found 500,000 bacteria per 100 mililiters of water. This is 500,000 potential carriers of disease—the dysenteries, typhoid, paratyphoid, yellow jaundice, polio—per one big mouthful.

So much for the geographical and bacteriological aspects of the problem. Sanitary engineers are confident that these can be licked. But Washington's peculiar political climate is another thing. As a city or metropolitan area, Washington has spread far out into Maryland and Virginia. On the heels of this rapid growth have arisen a lot of difficulties common to all the area's residents—transportation, education, utilities, sanitation, etc. They can be solved only through joint action.

Yet the top authorities who must pass legislation and provide the funds are in Annapolis, Richmond, and, for the District of Columbia, in a committee of the Congress. Many members of the latter are Congressmen from distant States, preoccupied with the troubles of their own constituencies.

For big, over-all problems, the usual procedure is for officials of the two States and the District to point accusing fingers at each other, particularly when it comes to providing money. Before anything effective can be done for the whole Washington metropolitan area, the public's interest must be aroused to practically a fever pitch.

Otherwise even urgent necessities can wind up on dead center. This is about where Potomac pollution was in the summer of 1954. Strong newspaper editorials and feature articles, radio interviews with sanitary and health authorities, and special programs by Washington area civic clubs and others, had gained some attention, and promises of improvement. But "the Battle of the Potomac" was still a losing campaign. Each month more and more untreated sewage was being poured into the Potomac and the streams that flow into it. Even the secluded woodland stream that runs through Rock Creek Park became contaminated, and the Park had to be closed to picnickers.

Then, as if in answer to a prayer, one of the Washington television stations found itself with a half-hour of Class-A evening time for which it had no sponsor. Fortunately, too, the manager of the station, a civic-conscious individual, was fully aware of the seriousness of the Potomac pollution situation. He wondered if a strong TV program, combining pictures, charts, maps and interviews, might not provide the Sunday punch, or follow-through, that would spark some real action. He felt it was worth a try.

So Carleton D. Smith, who is also a Vice-President of the National Broadcasting Company, gave orders that WRC-TV on Tuesdays, from 10:30 to 11 p.m., would explore every possible angle of this grave civic problem. Hit it hard, he told his staff; no holds barred as long as the program remained in good taste. It was to run for six weeks, beginning July 27.

The entire production was then turned over to one of the station's ace producers and announcers, Mr. Stuart Finley. Cooperation of the U.S. Public Health Service, District and suburban sanitation departments, the Interstate Commission on the Potomac River

Basin, and other interested groups, such as the Izaak Walton League, were quickly and willingly obtained.

Never, perhaps, has a TV document of this importance been put together so rapidly, Mr. Finley recalls, but willing hands seemed to spring up from everywhere. In addition to the agencies mentioned, the Office of National Capital Parks of the National Park Service, The Library of Congress, The Wilderness Society, and several others pitched in, each adding something—films, still pictures, charts, maps, statistics, background material, and the like. H. G. Ogden of the U.S. Public Health Service took over the writing of the narration. Ken Williams, of the TV station's photographic staff, not entirely satisfied with the films contributed by cooperating agencies, went out in a small boat to shoot some dramatic closeups of sewer outlets and mucky coves, and one of the men with him developed a mild case of dysentery, the production's only casualty!

The title chosen for the series—"Our Beautiful Potomac"—is of course somewhat sardonic. But it served to remind that Captain John Smith, the Potomac's discoverer, found it "fed with many sweet rivers and springs, which fall from the bordering hills," and that, with concerted effort, it might again become the fair stream our forefathers knew.

This dual theme carried through all six of the half-hour programs. Each nicely balanced the use of forceful films and startling statistics with live interviews, still pictures, graphic charts and music. In order to give a comprehensive picture, subject matter was divided: (1) The Problem Itself, and Background; (2) Upstream Potomac; (3) Potomac in the District of Columbia; (4) Suburbs of Washington; (5) Future Planning; and (6) Wrap-up, Or What Can Be Done Now.

Producer Finley realized that success or failure of a TV program on such a distasteful subject would depend upon strong, realistic treatment, right from the start. Opinions of experts, and suggestions from outsiders, are fine, and he would include them. But this approach had already been well covered by press, radio and club programs. TV would have to go farther if results were to be obtained.

"I decided to hit 'em over the head with a baseball bat on that first show," Mr. Finley declared, and he did. Skillful use of the movies taken in the small boat, covering the waterfront so dramatically that you could almost smell it, drove the message home. To many persons who had not kept in too close touch with the river pollution situation, it was a shocker indeed.

Some of the scenes were not too pretty, particularly the closeups showing sewer outlets pouring their bubbling filth right into the river; scenes showing up-ended ducks and schools of dead fish; vistas of once attractive coves now littered with muck and debris of every description. Here were tributaries so clogged with sewage solids that they were, in the words of the narrator:

"Too thick to navigate
Too thin to cultivate."

Briefly, the program revealed the sources of this dreadful witches' brew—refuse from the homes of one and one-half million people, washings from hotels and hospitals, laundries and mortuaries. Twelve relief sewers empty directly into the Potomac on the Washington side, many more in Virginia. Thirteen use the Washington Channel. Eighteen reach the Anacostia, which joins the Potomac in Washington. Millions of gallons of filth each day pour into the main stream until one gallon in six is nothing but sewage.

The District does have a modern sewage treatment plant at Blue Plains, but the program brought out what many citizens did not know—only about 35 percent of the sewage's harmful effects are removed before it is thrown into the river, too.

This sums up the first show. Pretty gamey stuff it was, relieved only by brief studious interludes during which Mr. Finley discussed salient points with William

Interviews supplemented special motion pictures of Potomac conditions. Stuart Finley, producer-director of "Our Beautiful Potomac," discusses pollution problems with Mark Hollis, Assistant Surgeon-General, U.S. Public Health Service.

A view of part of the plant that treats the sewage from the Pentagon and surrounding buildings. This is the only plant in the Washington area adequate to meet the needs.

H. Cary, Jr., of the District Department of Health; Mark Hollis, Assistant Surgeon-General, U.S. Public Health Service, and Larry Fisher, director of the Interstate Commission on the Potomac River Basin.

Public reaction was immediate. The NBC switchboard was clogged with calls after the first program, and they were still coming in 45 minutes later. In a few days the letters began to pour in. Most of them were from obviously intelligent, civic-conscious people who typed their comments and suggestions in well-phrased English. A few were scribbled notes from worried boys and girls, obviously up after curfew, and whose names the studio will not reveal!

A preacher in nearby Maryland wrote that he had asked permission of a community to use a swimming pool for the next mass baptism of his congregation, instead of the river. There were numerous queries about the safety of fishing and swimming. A doctor's wife who had been urging her husband to buy a small boat for recreation, declared she had changed her mind. Another viewer said he was "hot under the collar" about the whole situation, and hoped that the station would keep the issue "alive and before the public from time to time."

Press reaction was enthusiastic. Harry MacArthur, of the *Washington Star*, commented: "By the end of that half hour he (Mr. Finley) must have had all viewers with him softly singing 'River, Stay Way From My Door.' This member of his audience is not even sure that the bridges are high enough." Bernie Harrison, *Washington Daily News* called it: "The best public service series ever done locally."

While succeeding programs could not pack the wallop of the opening one, fan mail continued unabated. Many writers declared that their Congressmen and other responsible officials would hear from them about the need for immediate action, and promised to aid in any way they could. Some of the later programs had relaxing periods, during which some strikingly beautiful scenes of the upper and lower Potomac were shown. There were also amusing stills of a bathing beauty contest held at the former public beach along the Tidal Basin in 1922. The work of the sewage disposal plants at the Pentagon and at Blue Plains was also featured. Plans and proposals (including approximate costs) for enlarging or increasing the number of treatment plants and other facilities wound up the series.

While NBC-TV modestly disclaims credit for immediate results, it seems more than a coincidence that before the series was completed the Maryland Suburban Sanitary Commission signed an agreement to connect up its sewers with the District of Columbia treatment facilities. This matter had been hanging fire for nearly ten years, while two heavily populated Maryland counties had been pouring raw sewage into the Anacostia River.

Also, while "Our Beautiful Potomac" was still being shown, Senator Wayne Morse, of Oregon, introduced a bill to set aside $40,000,000 in Federal Funds to be given to any community in the Potomac River Basin matching federal money, on a 60-40 basis, for construction of new sewage disposal plants. The bill did not reach the floor of the Senate, but Senator Morse promises to re-introduce it in the new Congress.

In September, shortly after the program ended, Arlington County, Virginia, announced the awarding of a contract for construction that will eliminate the daily flow of 60,000 gallons of raw sewage into the Potomac opposite Washington. Arlington will then have partial treatment for almost all of its sewage. Sanitary engineers hope that the county will install complete treatment facilities in the near future. Alexandria has broken ground for the construction of its first treatment plant. Nearby Fairfax County is connecting with this plant, and has also just completed construction of one of its own.

The U.S. Public Health Service was so impressed with the favorable public reaction to "Our Beautiful Potomac" that it has reproduced the entire first program on motion picture film. This film will be made available to civic and sanitary engineering groups, faced with similar problems, elsewhere over the country.

Further evidence of the impact of this unusual document came in several special awards from civic organizations. The District of Columbia of the American Legion presented Carleton D. Smith with a citation of merit, for "outstanding service to the public in documenting and publicizing the (Continued on page 106)

Birding Moments in Mexico

By BARBARA O. WESTPHAL

In the Desert of Lions—No desert and no lions, but an old monastery set in a cool evergreen forest in the mountains above Mexico City.

WHAT was that tiny red bird flitting among the tall firs? He was so elusive that the first time I saw him I was unable to determine just where that white spot on his face was —perhaps a white bill, perhaps an eye ring. But my next visit to the Desert gave me a good view of the bright midget. The silvery white dots—for there were two—were ear spots.

"A bird that never was on land or sea," I mused as I leafed through my American bird books in vain, searching for something as bright as a tanager and as small as a goldfinch. At that time there was no book on the birds in Mexico. Then I discovered the old Museum of Natural History down by the railroad station in Mexico City. There, on a dusty shelf, was my little red bird, labeled with a charming Spanish name—*Oreja de Plata*, Silver Ears.

Being a very amateur bird watcher, I had never before quite appreciated the usefulness of the Latin names. But now I began to see that the scientific nomenclature was a universal language. When I consulted the index to Peterson's *Guide* I found the family name, *Compsothypidae*, which showed him to be a wood warbler. *Ergaticus ruber ruber* was his personal name. Silver Ears was the first Mexican bird I identified. After that I spent many hours in the dark old museum with a pencil and notebook, bird book and my glasses.

Whenever we had visiting friends from north of the border who were interested in birds, I would ask, "Would you like to see a real Mexican bird—one that isn't in your American books? I'll take you to the *Desierto de los Leones*." Silver Ears never failed to appear, nor did the friends ever fail to thrill at sight of him.

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In Huizachal—A bamboo village in the hot lowland forest of southern Mexico, reached only after our Plymouth had forded seventeen streams.

Miguel Alvarez de Toro, curator of the natural history museum in Tuxtla Gutierrez, capital of the State of Chiapas, displays his fine specimen of a white hawk.

MY minister-husband stretched out in a string hammock for a cooling rest before sermon time.

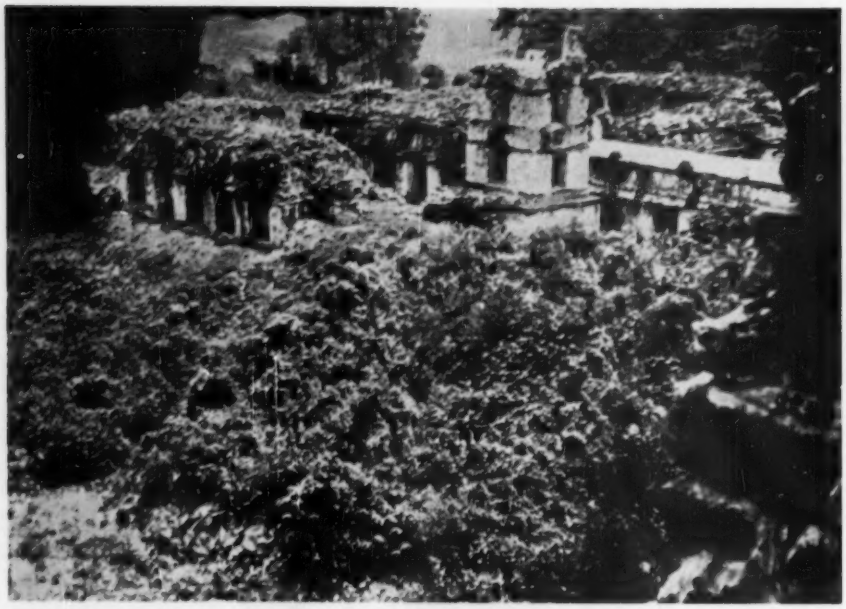
"You have an hour before the meeting," he told me with an understanding look. How well he knew the longing I had to get out into that tropical forest with my bird glasses! I lost no time in excusing myself from our puzzled hostess. As I slipped out of the garden I heard my husband trying to smooth over my rude departure. "My wife has a hobby. ."

The villagers peered curiously at the *Americana* who kept gazing at the trees through a strange contraption in her hand.

"Are you taking pictures?" one of the men ventured to inquire.

"Can you shoot them with that thing?" another asked.

I saw the eager look in a boy's eye and told him to come and have a look. He laughed aloud as he saw through the binoculars, for the pigs in the yard seemed to be right upon him. His curiosity overcame his fear and he began to follow me. He was perhaps ten



Palenque, in southern Mexico, lies a few miles from the railroad and from the crumbling ruins of Mayan temples and pyramids shown here.

In Palenque—A primitive little village in the south, a few miles from the railroad and a few miles from the crumbling Mayan ruins of temples and pyramids by the same name.

"I MIGHT as well give up birding!" I told myself in a moment of discouragement. "I could be at that funny little *pension* with Henry, sleeping a little longer or reading. Why must I rush outdoors every morning at the birds' first chirps?"

For two hours I had walked back and forth along the road outside the village, hoping to see some of the new tropical birds I knew inhabited those woods, but I had met none but old friends like orioles, catbirds and swallows.

Then, across a thicket, I saw the outline of a kingfisher in a tree. On second thought and second look I knew it could not be a kingfisher at all. There was not even a stream nearby. As I looked carefully at the chunky bird with its strong beak, a memory of a picture flashed to my mind. Where had I seen it? Probably in the *Birds of the Panama Canal Zone*, which I had been studying in lieu of a Mexican bird book. Could I be seeing a puffbird? The strange figure sat indifferently with his blackish back to me. No amount of mental telepathy would make him turn. I climbed up the bank. I climbed down again. I walked up the road. I walked down the road. I just could not get a front or side view. Nothing to do but wait. . .wait. He turned at last, and showed his white collar and black chest band. Except for his red eye he was all gray, black and white.

After a good look I walked briskly back toward town, anxious to find the picture and description, verify my diagnosis, and add the white-necked puffbird to my list.

Give up birding? A hobby that for twenty years had brought me both relaxation and excitement? Never!

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In Cuautla—A colorful town in central Mexico, surrounded by fields of sugar cane, blessed with a delightful climate, and always gay with bright flowers on the pastel-colored walls.

or twelve years old, but he wore not a stitch of clothing. Soon he was by my side and I asked him the name of some noisy birds that were all around us.

"*Chancuacas*," he told me promptly, and "*chancuaca, chancuaca*," was just what they seemed to be chattering to each other. The back, wings and tail were chestnut brown; the crown was black and there was a striking white line above the eye; when the tail was spread it showed a white trim.

Many months were to pass before my inquiries about the *chancuacas* were finally answered by Dr. Miguel Alvarez de Toro, curator and collector at the best little natural history museum in Mexico—the one in Tuxtla Gutierrez, capital of the State of Chiapas. He told me I had seen the Chiapas wren.

"A wren!" I gasped. "Why, those birds were as big as robins!"

"Almost."

"They were as gregarious and as loud as jays."

"*Si, senora*," he agreed, "they are very *escandalosos*."

The word amused me. Scandalous was just it! They were a bunch of noisy village gossips.

Blake's new *Birds of Mexico* calls the *chancuaca* the giant wren, *Compylorhynchus chiapensis*.

To return to my little guide in Huizachal: It was with the naked boy at my side that I saw the lovely rose-breasted becard that afternoon. *Degollado*, the Mexicans call him, because, with the rose spot on his throat, he seems to be cut and to be bleeding. That afternoon I saw also my first glorious motmot, sitting stupidly on a branch over the path, flicking his long pendulum-like tail from side to side. The boy said it was a *Guarda-barranca*, a name given because of its habit of guarding the banks where it makes its nest in the side of the bank like a kingfisher.

In gratitude I thought, trust a small boy in any country to know about the birds!

Birding from the back of a horse or mule had its drawbacks, since it was not possible to stop the party to go and identify a bird.

IN THE late afternoon we were standing outside a church when friends called my attention to the birds flying around a high factory chimney in a nearby yard.

"They are swallows," one said.

"No, they are bats," argued another.

To me it seemed they were neither bats nor swallows, but I did not have my bird glasses with me. In great circles they wheeled around against a sunset sky, and each time the wheel came near the chimney a few dropped down into it. A half-hour passed before they were all gone and the last one had fallen into the chimney. Having read that the whereabouts of chimney swifts is unknown during the winter, I was much interested, for it was November.

I determined to be at the same spot next morning before sun-up with my binoculars. I rose early and tip-toed along the corridors of the *pensión* to the door, only to find the great iron gate tightly padlocked. I saw a servant and asked who could open the gate for me. He advised me to knock on the owner's bedroom door. Soon a sleepy figure appeared in a robe. Noticing that I had a scarf over my head he asked me, "Are you going to the early morning mass, *senora*?" He was not used to tourists with a hobby like mine!

For two hours I walked the village streets, always keeping that chimney in sight. The sun rose and the village came to life, but not one swift appeared. Evidently they were up and gone before me, out hunting insects on tireless wings. They would never stop to perch all day—indeed, they cannot perch at all. Only at night do they rest, clinging to the sides of the chimney with their weak feet, braced by stiff tails.

A few weeks later we had another opportunity to be in Cuautla. This time even my husband wanted to see the swifts. They came again, but not in such large numbers as before. I asked a friend living near the factory chimney to notice how long they stayed. She wrote me they saw them last the twentieth of December and that they had stayed since the first of October. It was impossible to know which species of swifts they were without collecting a specimen, so for me the mystery remained unsolved.

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In the Cintalapa Valley—An upland valley in the State of Chiapas through which runs the Cintalapa River.

WE HAD left Tuxtla Gutierrez early, so we stopped on our way toward the Pacific Coast to have breakfast at a lone restaurant on the International Highway.

"Call me when breakfast is on the table," I said to my patient husband as I slipped around the corner of the house toward the bushes. We had an understanding that the minutes wasted while waiting to be served could be improved by me for birding. He was used to ordering my scrambled eggs and tortillas and waiting alone.

On the ground, under the brush, was an entirely new bird for me. Hastily I made mental notes. Size: Sparrow. Color: Blue-gray back, wide black eye-line with white line above, pure white throat and abdomen with a bright red spot nearly covering the breast. The first bird that came into my mind was a redstart, because this bird had the same habit of displaying its black and white tail, spreading and closing it like a fan. But there it was hopping around on the ground like a common towhee.

I asked the cook, the waiter, the owner of the restaurant about a bird with a red breast. "It must have been a *cardenalito*," they told me easily. No, indeed, I assured them I knew the *cardenalito*, as they called the vermillion flycatcher.

"I'll just slip out again while you pay the bill," I told my husband, not waiting for an answer. When I appeared a few minutes later, my son called, "Go back to your birds, mom, the gas tank has a leak!" "What a break!" I thought, in more than one sense. I followed a brilliant trill among the bushes and came upon a wren, quite unlike any I had seen before. The rufous on its tail was *especially* rufous, the brown on its back *especially* rich, the breast *especially* white, the spots *especially* dark and distinct on the breast, the eye line *especially* (Continued on page 106)

The Climbing Fern

By ANITA BIEN

Did you ever see a fern climbing? Well, I did! Most Nature students are unfamiliar with the rarer genus of ferns distinguished by a climbing habit and called *Lygodium*. There are not many species of climbing ferns and all but ours—*L. palmatum*, native to the Eastern United States—are tropical, or grow in the warmer temperate zones. In the early part of the 20th century a Japanese climbing fern was introduced into cultivation in Georgia, around Thomasville, and is now found in several southern States, but *Lygodium palmatum* is our only indigenous climbing fern. The great majority of the species of *Lygodium* are natives of the tropics, and several are Asiatic. Strange, but many of our Blue Ridge plants and shrubs are also found in the Orient.

The climbing fern, courtesy of *Guide to Eastern Ferns*, Academy of Natural Sciences, Philadelphia 3, Pa., $2.10.

Lygodium palmatum is actually unable to stand erect because its one to five-foot, flexuous, thread-like stems are too fragile to support themselves. It has therefore developed the habit of entangling itself on less delicate and slender neighboring herbs, shrubs and saplings for protection. The very fact that it is so flexible accounts for the origin of its Greek name—"lygodes"—meaning "flexible." It is also known as the "creeping fern" from its appearance of creeping or trailing on the ground.

Even a person indifferent to the beauty of ferns is arrested by the strange, lace-like foliage of this lovely plant, likened to a tiny maple leaf by some, but more generally accepted as resembling a small hand. Palmately five to seven-lobed, the yellowish-green pinnules, arranged in pairs, appear like chubby fingers. Close examination reveals the spore-bearing part borne at the summit. Mabel Osgood Wright, in her book *Flowers and Ferns in Their Haunts*, published in 1901, colorfully described it as "sometimes ends in a spray covered with rusty dust." The mass of feathery leaflets forming the terminal panicle is truly beautiful.

When I first stumbled upon this fern, I thought it was a parasitic vine. It was twisting itself about anything and everything near it. Scratched by catbriers, I managed to gather some and press it. It makes handsome prints. Upon examining the attractive tips, I noticed the sporangia, so immediately checked my reference book on ferns. I was happily rewarded. One's first impulse would be to classify this peculiarly delicate fern as belonging to another race of plants. It grows from a slender, creeping rhizome. Some of the pinnules are short and blunt, while others grow into graceful, long, slender tips; sometimes the wiry stems droop low upon the waters of our cold trout streams.

Lygodium palmatum has also been called the "Windsor" fern, "Alice's" fern, and, more commonly, the "Hartford" fern, the latter after the name of the capital of the State of Connecticut, where it was formerly abundant on the low meadows and river banks. As early as 1876 Asa Gray classified it as "rare" in Connecticut; for it had been so extensively collected by reckless plunderers as a decorative material that it had become almost extinct. The fern was first found by William Bartram in Georgia, but he gave it no valid name.

Several generations ago, the pressing of flowers and skeletonizing of leaves were popular hobbies, and this quaint fern was thoughtlessly and ruthlessly plucked by hobbyists, as well as those with an eye for business. It was gathered by the bushel and sold on the Christmas markets as far south as Washington, D. C. These destructive practices contributed to its extermination in certain localities.

In 1869 the legislature of Connecticut passed a law making it illegal to gather this ornamental fern, either by fronds or roots, and this special law was embodied in the revision of the Statutes of 1875. It may have been the first law ever passed giving a plant special legal protection, and, certainly, it prevented its annihilation.

While killing frosts quickly destroy the beauty of the clusters of spikelets, as well as the mature portion of the plant, some of the (Continued on page 106)

Stone Mountain, an enormous boss of granite rising from the foothills of the Blue Ridge Mountains, sixteen miles east of Atlanta, Georgia.

The Inexpensive Mountain

By MARY SUZANNE HOPKINS

Photographs from Chicago Natural History Museum

MOUNTAINS were a bargain in 1790! If you had been in the market in Georgia you could have bought an enormous granite mountain for only a pony and a gun. It was the Federal Government that snapped up this bargain in a deal with a half-breed chieftain of the Creek Indians, Alexander McGillivray. Even years later the price had not increased appreciably when its new owner, a plantation proprietor, disgusted that the mountain rose from his plowed field sold it for a five-foot flintlock rifle.

From this humble beginning in recorded history this mountain, Stone Mountain, sixteen miles east of the present city of Atlanta, now stands proudly beside El Capitan of Yosemite National Park, and Sugar Loaf Mountain of Rio de Janeiro, as one of the most famous granite masses in the world. This tremendous dome of naked granite—rather resembling, from a distance, a great blister on the surface of the earth—rises precipitously 680 feet above the surrounding plain. It is elliptical in shape, being one and one-half miles long and three-quarters of a mile wide. It is more than seven miles around the base.

The mountain is completely composed of medium-grained, light-gray granite that varies little throughout the mountain as to color or composition. This means that its visible section, probably only a small part of the entire mass, contains the fantastic quantity of more than 7,000,000,000 cubic feet of granite, or about 1,250,000,000 tons. The economic possibilities of such an amazing mass cannot be overlooked, for not only does it provide an almost infinite supply of granite for building stone and monuments, but its peculiar structure is a drawing card for the tourist. And, to enhance its natural spectacle, a huge memorial to the Confederacy, carved in the stone of the sheer eastern side of the mountain, may be completed at some future date.

This colossal dome supports practically nothing in the way of vegetation. Its soil is blown and washed away as soon as it forms. The granite mass commands and dwarfs the surrounding neatly terraced farms and patches of forest, which are the foothills of the Blue Ridge Mountains. A moderately active climber, scrambling up its southern slope, the least steep side, is impressed by the great panorama of the view, hundreds of square miles being visible. But upon closer observation one notes that, except for the few mountains rising in the distance to the north and the tall white buildings of downtown Atlanta appearing on the horizon to the west, the view is surprisingly uniform, and even monotonous. The foothills roll on, wave upon wave, as far as the eye can see.

One might well ask why this seemingly incongruous dome rises from a rolling plain. How did it originate? A textbook will pass it off easily, saying Stone Mountain is a typical monadnock. But even this is unusual as this, the largest granite monadnock in North America,

Closeup of the surface of Stone Mountain showing the exfoliation or scaling off of layers of granite. Note the relatively flat topography of the surrounding land.

(Below) The dark streaks are due to the stain of oxidized iron minerals in the granite and to the growth of lichen.

appears in a State where monadnocks are rare. However, even when we have looked up "monadnock" and found that it is a residual remnant of resistant rock rising above a low-lying plain, what do we know? What is it a remnant of?

To understand we must peek back through geologic ages to glimpse the true relation of this granite mass to the surrounding rocks. Although geologists are not in complete agreement as to the exact dates of the geologic events, they do agree, for the most part, as to their order. We find that perhaps several hundred million years ago, in Early Paleozoic time, there was no granite in this position at all. The rocks that now surround this mass then covered the whole area, and to a height probably several thousand feet above the present land level. Over the ages these rocks became compressed, broken and altered by enormous temperatures and pressures, thus changing the original rocks to metamorphic gneisses and schists. While these changes were taking place, great masses of molten igneous rock, of which granite is one, welled up from within the earth, intruding these metamorphic rocks and cooling and solidifying there, still at great depth. Erosion of subsequent ages gnawed deep into these altered rocks, causing them to suffer much more than the more resistant granite. Thus today we see the fruit of the erosion, the enormous granite mass, once so far below the surface, now standing high above the original rocks, into which it so rudely intruded.

The present shape of Stone Mountain cannot be attributed entirely to the form that the molten granite took in intruding the metamorphosed rocks. Many forces have been at work during the millions of years since the original event. First, as the rock overlying the dome was gradually eroded away, the great pressure of its weight was slowly released. This allowed the granite body to expand outward to a minute extent, causing tiny cracks to form parallel to the surface of the dome. These concentric joints, known as "lift" to quarrymen, divided the igneous mass into thick layers. Examples of this jointing may be readily seen in the layers, varying in thickness from a few inches to one hundred feet, on the domes of Yosemite National Park.

However, there are more visible and active forces affecting the shape of Stone Mountain. These processes are known collectively as (Continued on page 108)

The Ways of A Muskrat

By ROBERT LEO SMITH

PHOTOGRAPH BY R. M. CADY, COURTESY PENNSYLVANIA GAME COMMISSION

Prolific, adaptable and tenacious of life, the muskrat has sustained heavy trapping for its fur, yet survives.

THE muskrat is one of the most remarkable of North American mammals. Excepting the beaver, no inland mammal is so well adapted to an amphibious way of life. Its prolificacy, adaptability and tenacity of life have enabled this furbearer to survive the heaviest trapping for its fur, which makes it, economically, probably the most valuable wildlife species in North America.

The first published description of the muskrat was by Captain John Smith, who wrote, in 1612: "Mussascus is a beast of the forme and nature of our water *Rats*, but many of them smell exceedingly of muske." The name muskrat apparently was given by the French in Canada. As early as 1635, Father Le Jeune, a Jesuit missionary, described the *Rat musque*. In 1656 he wrote: "There are found in these regions of America, animals to which the French have given the name muskrat because, in truth, they resemble the rats of France—except they are much larger and smell of musk in the Spring. The French are very fond of this odor; the Savages dislike it as if it were a stench." The Cree Indians of the Atlantic Coast called this animal musquash, a name long used by the fur traders, and, perhaps, a more pleasant name. Its current generic name, *Ondatra*, is another Indian name for muskrat; and its specific name, *zibethicus*, means musty odor.

Although the muskrat resembles the beaver in form and color, except for the broad, flat tail, it is really more like a very large meadow mouse. It is heavy set and short-necked, with small ears, beady black eyes and long, nearly naked, rat-like tail. The pelage consists of a dark gray underfur, a main coat and glossy dark guard hairs. Generally the muskrat is a dark chestnut color with a lighter belly, but there are regional and physical characteristics. In the Delaware and Chesapeake areas the muskrats are dark, some nearly black.

The muskrat is well adapted for semi-aquatic life. Its hind feet are partly webbed and fringed with stiff hairs, which aid the animal in swimming. The forefeet are small and used to handle food and for progression on land. The tail is flattened vertically and used both as a rudder and as a scull to propel the animal through the water. Its fur is almost waterproof. The lips are so formed that the muskrat can close them between the incisors and molars. This permits it to gnaw under water and to carry food and building material while swimming, and going about normal muskrat business.

According to an ancient Indian legend, as related by Seton, a sun god, in return for services rendered during a flood, offered the muskrat any place in the country it wished to live. The muskrat chose the lake, but it returned, dissatisfied, and asked for grassy banks instead. Then, to its discomfort, the muskrat found it had no place to swim. Again it returned. This time the sun god, seeing the muskrat could not make up its own mind, told it that it would live in the "between-land" of marsh, where there is both water and grass. Here the muskrat was happy and prospered.

So it is today. Wherever fresh water and grassy vegetation meet, the muskrat may be at home. It is found over nearly the whole of North America from the Gulf Coast north to the Yukon.

Muskrats, although omnivorous, prefer a vegetative diet. Cattails, arrowheads, sedges, bulrushes, pondweeds, waterweeds, bluegrasses, clovers and algae are on its menu. The muskrat gathers twice what it needs and leaves half of that lying in piles, picked over and uneaten. If it wishes a change, or if there is a lack of plant food, the muskrat may turn to fresh-water mussels, fishes, frogs and crayfish. In times of crisis it may even feed on the carcasses of ducks, rabbits and even its own kind.

Muskrats living on streams flowing through agricultural lands find corn an added treat, much to the farmer's concern. Although they do help themselves to small, juicy stalks in spring, the animals enjoy this delicacy most during late summer and fall. At this time they cut the stalks and carry them back to their holes to feed on the milky or ripened ears. They may even use corn stalks to plug burrow entrances that are exposed by low water.

In marshy areas the muskrat builds a house or lodge, piling up marsh vegetation and mud in a large mound in shallow water. To make inside accommodations, the animal gnaws away the interior, leaving a platform with one to three chambers above water level. These are reached by one to several plunge holes cut in the floor and leading to water, or to an underground tunnel extending out into the marsh.

On the next two pages are seen typical scenes from the life of the muskrat, as recorded by the author in his field studies of these interesting and valuable animals.

Where high, firm banks exist in its habitat, especially along streams, the muskrat prefers to construct a burrow deep into the bank and ending in a dry nest-chamber above the high-water mark. This nest is reached by a complex series of tunnels with three or more entrances, cut directly into the bank and either below or near the water's surface.

The muskrat is a home-loving animal and dislikes to desert its dwellings. If the marsh starts to dry up, it may move farther out, where some water still exists, and build a temporary lodge. But, still attracted to the old, the animal beats a trail between the two for many weeks. As water conditions grow worse the muskrat becomes more frantic. It deepens passageways and canals, and digs pockets and blind burrows for underground feeding areas among water plants. If the habitat dries up completely the muskrat hangs on desperately, as long as food is available, then leaves.

When this occurs, the muskrat is in real trouble. Driven from its home, it attempts to settle elsewhere. But neighboring muskrats, defending their own areas from the refugees, fight them relentlessly. Many of the animals are killed outright, or are so badly wounded that they die. Others are driven out to seek new living quarters. Some find shelter in woodchuck holes, cornfields, brush piles and under sheds and corn cribs. Those not so fortunate wander about, finally to die from exposure, predation and starvation.

Although the muskrat may appear to be somewhat gregarious, it is not exactly a sociable animal. During winter, family groups may occupy the same lodge or burrow. But as spring approaches the muskrat grows irritable, restless and intolerant. When the ice has left the streams and marshes, the *Ondatra* leaves to seek suitable breeding areas. Some will travel only a few hundred yards, others up to three miles. Once the mated pairs have settled down in their prospective summer range, they will tolerate no others in their nearby vicinity. The males defend their territories savagely.

When well settled in their territory, which seldom exceeds 200 yards, the muskrats go about the business of raising their young. Their prolificacy has been somewhat overrated. Northern muskrat usually have two, sometimes three litters a year, with five to six young in each, born from late March to July. In the south, the breeding season is year-long. There each pair has five to six litters of three to four young. The gestation period averages around 29 days, and litters are usually spaced a month apart. In spite of old beliefs, the young of the year do not breed until the following spring.

At birth, young muskrats are small, blind, nearly helpless and with scant hair. By the end of the first week they are covered with a coarse, gray-brown coat. During the second week they can scramble about the nest, climb on low, floating objects and dive, even though their eyes do not open until the 14th, 15th, or 16th day. By the fourth week they are weaned and driven from their home to make their own way in the world. In the meanwhile their parents are preparing for the arrival of new young.

The muskrat has to share its habitat with water-loving creatures. It gets along well with some; with others there is conflict. The mink has long been regarded as the muskrat's mortal enemy. Yet, in winter, muskrats often feed on fish and frogs heaped about by minks. Minks winter in old muskrat dens; and breeding minks and muskrats may use parts of the same lodge or burrow system. In fact, the most permanent mink dens are those occupied sufficiently by muskrats to keep them in repair.

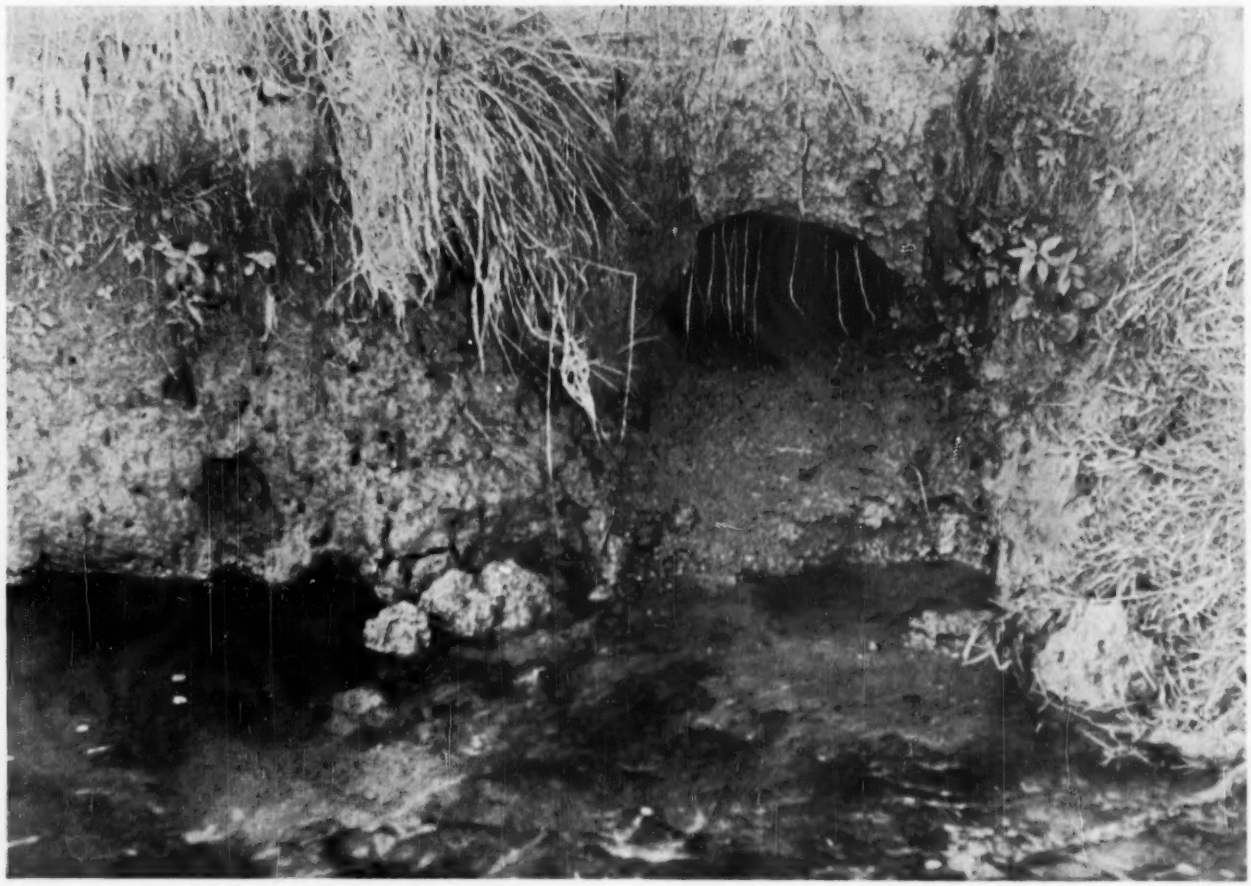
When the two come in conflict, the muskrat, if in a good defensive position, is a formidable adversary and the mink may never survive its sharp, slashing teeth. If the going is too rough, a group of muskrats may join in to drive off an attacking mink. Usually the muskrats that do fall prey to minks are the old, the feeble, the young, or those living under adverse conditions.

The raccoon is more dangerous to the muskrat because its attack is more insidious. The 'coon ambles out to a muskrat lodge, rips open a hole and enters to kill and feed on the young. Red foxes find muskrat hunting on a dry marsh an exciting sport; but once the marshes fill with water the muskrat is safe.

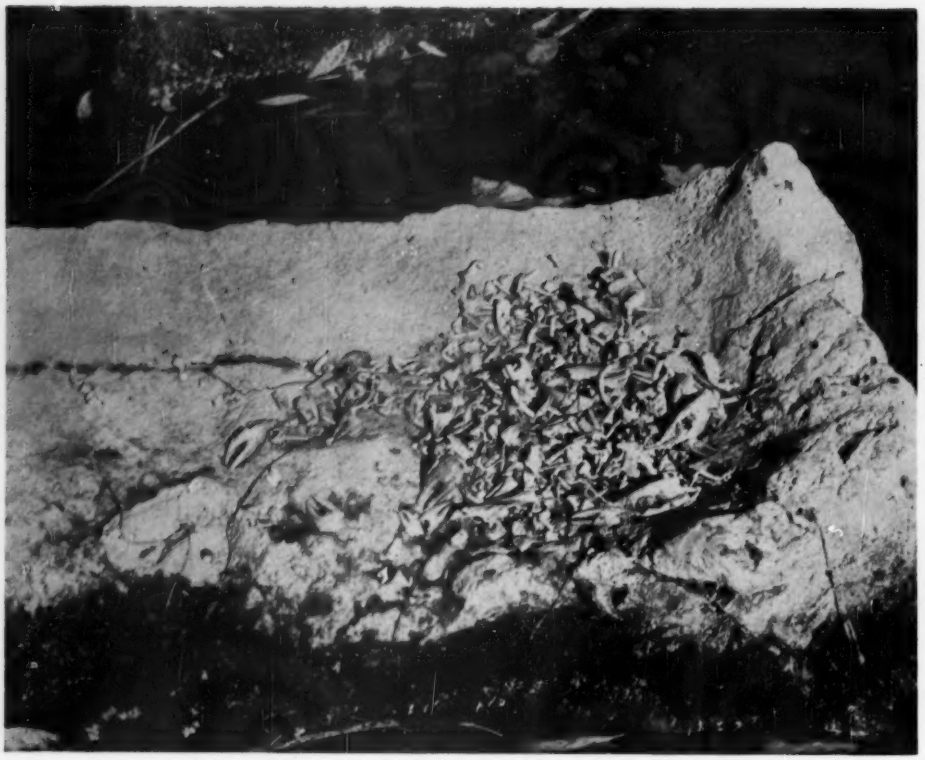
But the greatest single threat to the muskrat's existence is the trapper, who has sought it for years. The muskrat first appeared commercially in England and France during the early American period. Since that time muskrat fur has grown to be the most important and versatile in the industry. It exceeds all other fur-bearers in numbers trapped and in the value of the pelts. Each year between 18 and 20 million are trapped in the United States. Louisiana is the leading muskrat State, but the most valuable pelts come from the northern states and Canada, where colder weather produces a heavier fur.

(Continued on page 108)

Where grassy vegetation and fresh water meet, the muskrat is at home. Under the overhanging canary grass along the good muskrat stream above, burrow entrances and feeding dens are hidden. Below, an old muskrat burrow has been exposed as the bank has been cut away by cattle and water. At the left of the picture, however, is a dark area in the water, under which a new entrance has been constructed by the animal.



The remains of a number of crayfish dinners are left on a stone in midstream by muskrats. Crayfish are favored foods of many stream muskrats. Below, a muskrat house, built near the edge of a small, cattail-bordered pond, is exposed by low water. Such a situation endangers the animals' existence.



In June, the bitterroot, Montana's State flower, spangles the prairie with its blooms of delicate shades of pink. Below, a Flathead Indian grandmother digs bitterroots with the traditional, hand-made digging iron, which disturbs a minimum of sod. She gathers the roots into her buckskin pouch.

Bitterroot Time

By PEYTON MONCURE

EVERY year during May and early June, for generations past, the Flathead Indians of western Montana have been coming down from their reservation to dig bitterroots near the city of Missoula.

The bitterroot, the State flower of Montana, has long, branched roots that are relished by the Indians as a dried winter food. They call it "spitlem" or "spatlem," but scientists call it *Lewisia rediviva* after Captain Meriwether Lewis of the Lewis and Clark expedition.

There are only a few scattered camps now on the open flats near the city, and in small areas up the Bitterroot Valley. Less than a generation ago the Indian camps dotted the vicinity in a sprawling village, but the younger generation cannot be bothered with digging bitterroots.

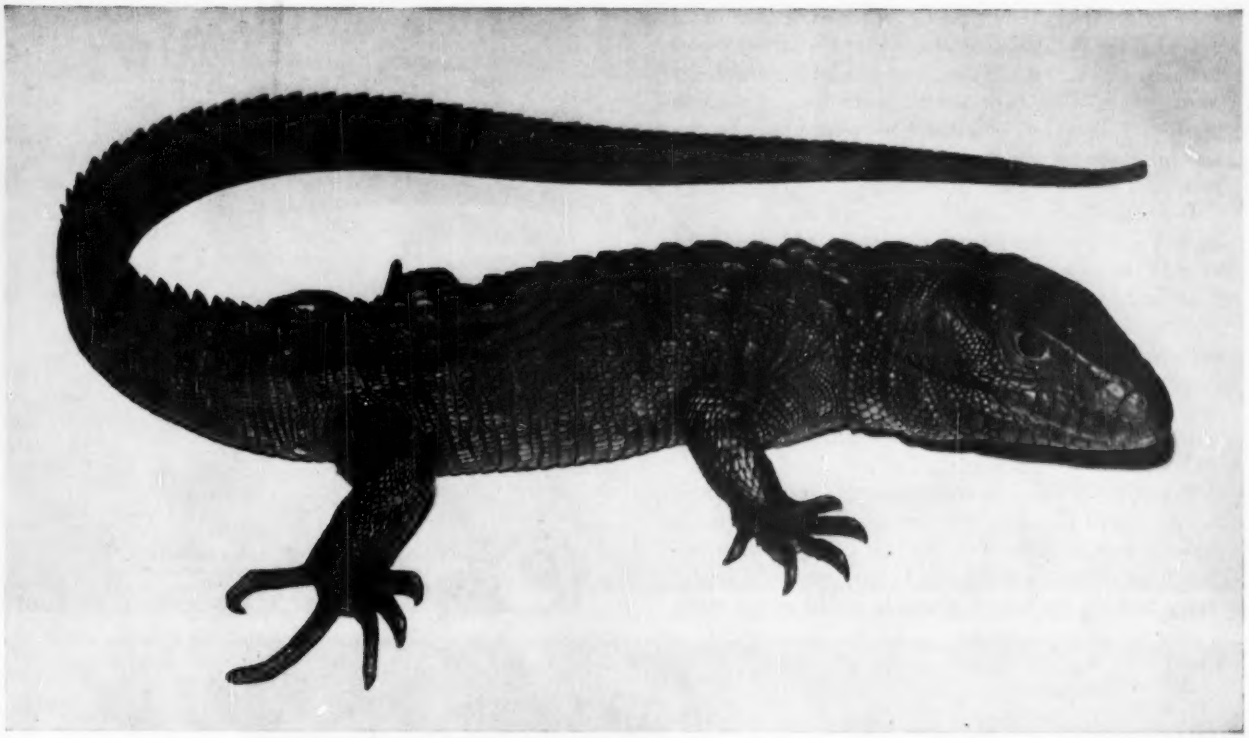
The plant is only an inch or so high, with straight, spine-shaped leaves that grow in a tiny clump. The branched roots, however, are several inches in length. During May the plant has several pink buds; and it is at this stage of growth that the Indians prefer to dig the roots. The buds finally open in June, and then the fields are spangled with pink blossoms of about two-and-a-half inches in diameter.

It seems safe to say that in a few more years the age-old custom of digging bitterroots will be a thing of the past, along with so many other colorful Indian customs and arts. In the meantime, the coming of the Indians with their tents is eagerly awaited each spring by the children of Missoula, who go out to the camps to watch and make friends. A few scholars, writers, and photographers have been attracted, as well.

Bitterroots drying in the sun and, beside them, three of the digging irons. Digging is done in the cool of morning or evening. During the day the Indians sit in the shade of their tents peeling the roots with a paring knife.

The squaws and children do the digging. Here a Flathead Indian grandmother shows her grandson how it is done, although the younger generation shows little interest in this traditional harvest.

Bitterroots drying on burlap. A couple of weeks of digging and drying furnishes a family with enough roots to last the winter. Most white men find the bitterroot lives up to its name and is too bitter, but it appeals to the Indians' taste. The pared roots are shining white.



Averaging nearly a yard in length, caiman lizards have been recorded at a maximum of more than four feet. It lives in the mangrove swamps of South America's northeast coast, where snails and mussels that are its favored food are plentiful. It is equipped to cope with them.

Saurian Shell Crusher

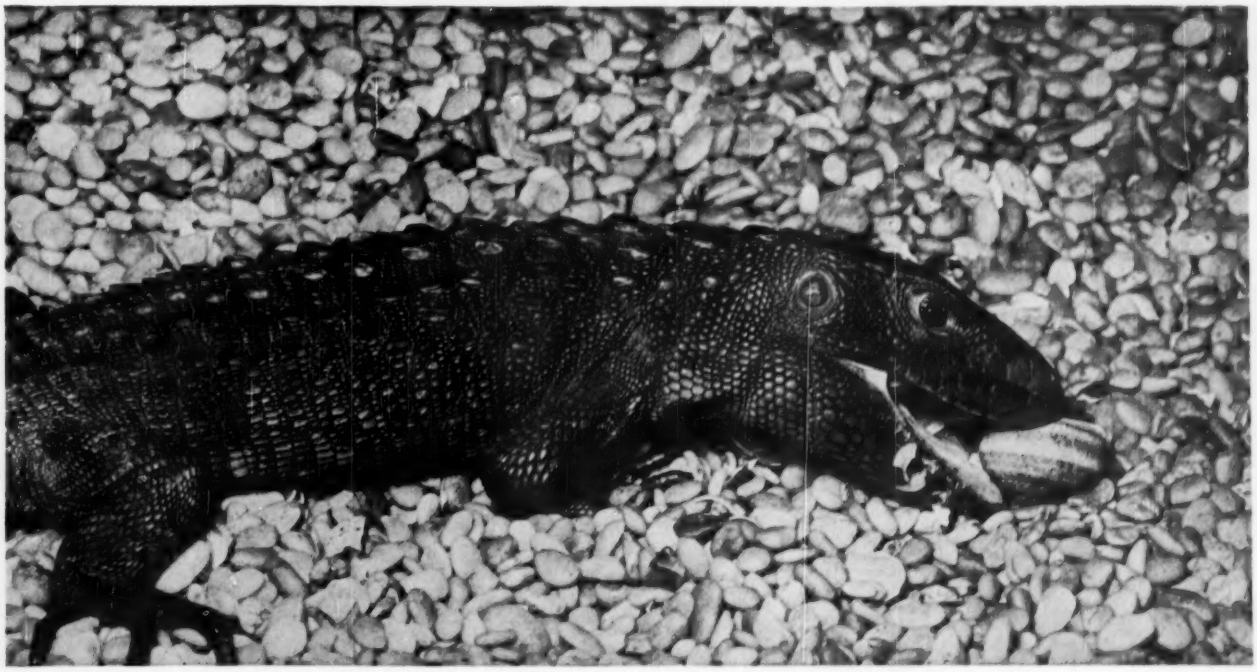
By ROGER CONANT

Photographs by Isabelle Hunt Conant

WE USUALLY think of lizards as eaters of insects and other small animals. Larger kinds, of course, would take larger prey, rats or birds, perhaps. And there is that big fellow in the East Indies, the Komodo Dragon, that is ten feet long and able to pull down pigs and deer. But snails?

The caiman lizard, *Dracaena guianensis*, makes a specialty of dining on mollusks. It is a large lizard with an

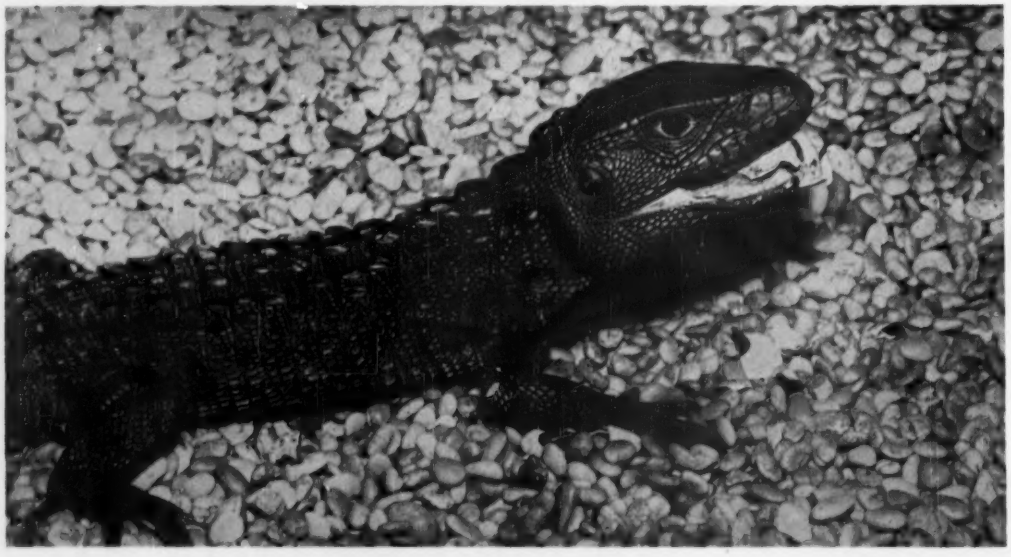
Given a snail, the lizard approached it slowly and deliberately, grasping it firmly with the tips of its jaws.



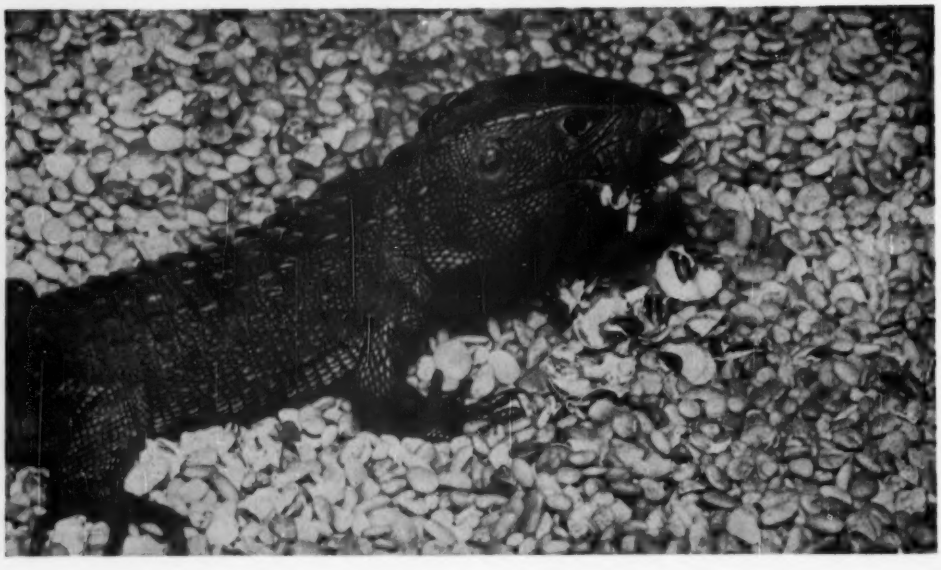
average length of nearly a yard. When our caiman lizard arrived at the Philadelphia Zoo, a keeper was dispatched to the Italian markets. He returned with a pound of *Helix lactea*, snails with shells a little more than an inch in diameter. They are imported from areas bordering the western Mediterranean for human consumption, and fortunately are available the year around.

The name "caiman Lizard" is a coined but appropriate one. For this saurian bears a distinct resemblance to the caimans, members of the crocodile group that occur in its homeland. Like them it has a broad, flattened tail, and the large scales protruding from the back look somewhat like the plates of the caiman's dorsum. There are many points of difference, however. The head is distinctly lizard-like, the toes are not webbed, and the pupil of the eye is round instead of being elliptical—all characteristics that contrast with those found in true caimans.

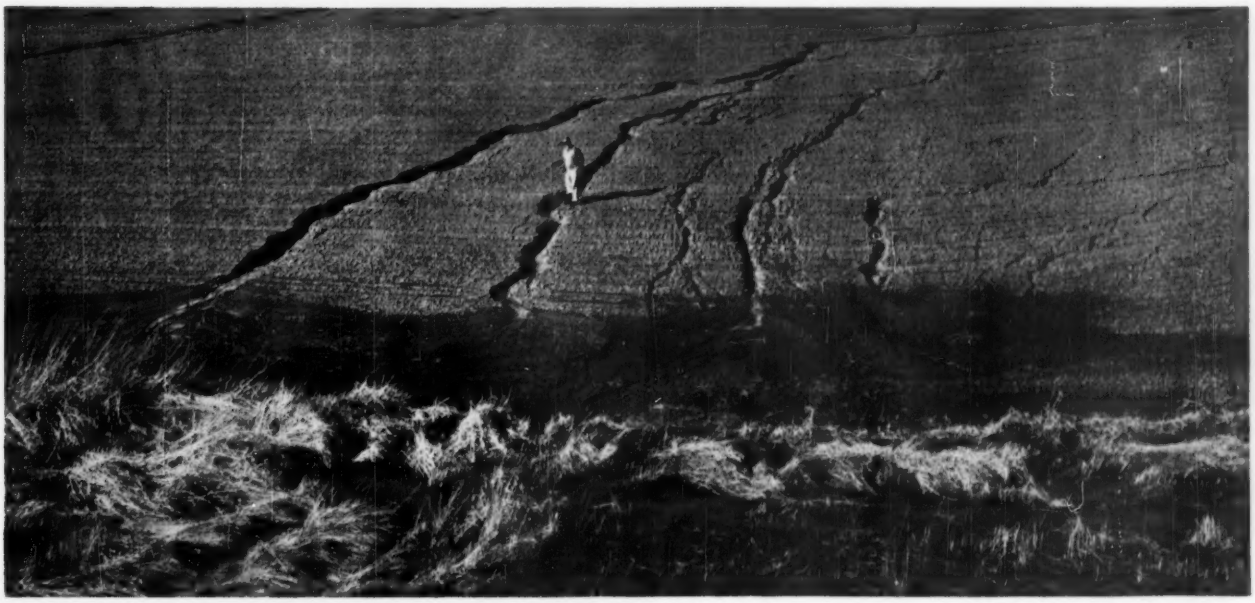
The general coloration is dark brown with some orange-brown around the mouth and underparts. Except for its rather grotesque appearance, the lizard attracts little attention from visitors to the Zoo. If only we could feed it every hour on the hour it probably would attract many.



Lifting its head, the lizard relaxed its grip slightly and the snail rolled to the center of the mouth, until the molluscan delicacy was in just the right position. At each side of the jaws are four large, flattened teeth with rounded crowns. It is these that effectively crush the shell of the snail.



(Above) The lizard pressed his jaws together, like the arms of a nutcracker, and the shell burst with a dull snap. The reptile rested for a moment. Then the tongue of the lizard (right) was brought into play, carefully pushing out fragments of shell before the meat within was swallowed.



What bad soil conservation practices did to a farm near Moscow, Idaho. John Nicholas, soil conservation technician inspects the damage. With a measuring stick he found that the gullies averaged about two feet deep. On a tenth-acre plot, including this example of erosion, a soil restoration project was held to demonstrate how much soil had been lost and how difficult and expensive it was to restore soil to eroded acreage—soil that could be kept where it belonged by proper conservation methods.

Losing Soil Is Expensive

By BOB FORBES

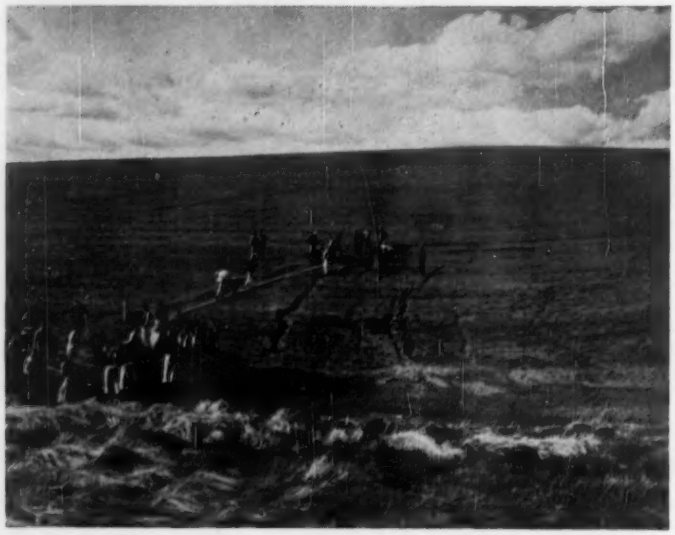
U. S. Soil Conservation Service Photographs

TWO-FOOT-DEEP gashes in hilly crop land will form in as short a period as three months, losing as much as ninety-eight tons of soil per acre if an entire acre is thus badly eroded. The Snow brothers found this out in March, 1954, on their farm near Moscow, Idaho.

During plowing the previous fall they had allowed a hired man to cultivate and recultivate their land eight different times for weed control. All this was done without the recommended incorporation of

Future Farmers of America loaned their strong backs to the task of putting on a soil-loss demonstration. Reuben Bauer, bank official, presided at the scales, on which each wheelbarrow load of soil was weighed so that it could be shown just how much soil had to be restored and how much back-straining effort went into it.

Wheeling the barrow-loads of soil out over a plank pathway, the FFA boys dump it into the erosion gullies, filling them firmly with the soil. Sixty-five boys made 115 trips to fill the washouts on this small plot, moving 19,710 pounds of soil in one hour. If they had been doing the same thing on one acre of eroded land, ninety-eight tons of soil would have been required.



Distant view of the task of rolling the wheelbarrow loads of soil up hill over a plank. It took one worker to push and one to pull. At the right are gathered both workers and observers. Some four hundred people turned out to witness the demonstration and listen to the description of what was going on. Below, Del McPherson of the Moscow, Idaho, Chamber of Commerce; Mr. Nicholas of the Soil Conservation Service, and Glenn Lorang, farm editor of KHQ Radio Station in Spokane, Washington, watch progress. Radio description carried the story to an unseen and unseeing audience.

crop residues in the surface layer of the soil. In fact, the soil was so worked that the local Latah County Soil Conservation District technician, John Nicholas, likened it to "dust."

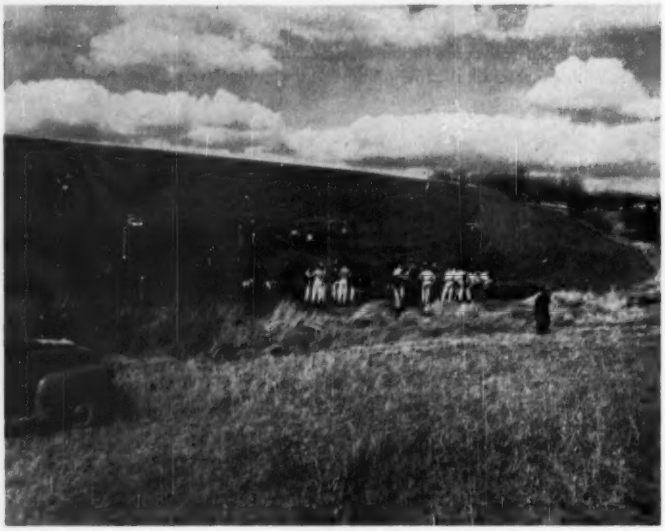
"What" he asked himself, "would be the best way to awaken farmers to the ever-present danger of soil erosion? Why not refill part of the Snow brothers' gullies using hand labor?"

District officials were contacted and fell in with the plan to fill gullies on a tenth-acre plot as a public demonstration. The strong backs of Future Farmers of America, and boys in the veterans-vocational-agriculture-class, were enlisted.

A board walk was constructed from the sediment-filled side of the nearest rivulet to make the gullies approachable by wheelbarrow. A small festival, with 400 people participating and watching, was held to attract farmers and townspeople. Speeches on the importance of soil conservation were given by district officials and professors from the University of Idaho at Moscow, and from Washington State College, in nearby Pullman.

Two county bankers acted as weighmasters at a platform scale to compute the weight of the soil moved.

Sixty-five boys in the shovel-and-wheelbarrow brigade made 115 trips to fill the washouts on the small plot. The boys moved a total of 19,710 pounds of dry soil in one hour. Wheelbarrow loads weighed up to 500 pounds each, which required



one boy pushing and one boy pulling. Boys shuttling back and forth with wheelbarrows impressed everybody at the demonstration with the importance of soil conservation practices.

When people with a mathematical turn of mind set about reducing the operation to figures, it was found that to do a like job on a full acre of similarly eroded field would require the moving of ninety-eight tons of soil. The boys on the tenth-acre plot put in twenty-five man-hours, which would be 250 man-hours on an acre, and 7500 man-hours on the entire 30-acre field, if it were in similarly bad shape. Carrying the statistical story farther, it was figured that it would take one man two and one-half years, working every day in the year for an eight-hour day, to fill the gullies. That came out to 912 days, which, at ten dollars a day, multiplies out to a cost of $9120.

This project successfully demonstrated the great loss from soil erosion and improper soil practices. Figured out in hours of back-breaking labor and out-of-pocket dollars, it made everyone stop and think.

On the Watersheds

THIS is a report and a review. It is a report on the recent successful National Watershed Congress in Washington, D.C. It is a review of an important and provocative book entitled *Big Dam Foolishness* by Elmer Peterson (New York: Devin-Adair; $3.50.) Space does not actually permit adequate attention either to the meeting or the book, of course. One should read the published proceedings of the former, and from cover to cover of the latter, in order to realize the importance of both. We trust that many people will do so.

The first National Watershed Congress was inspired by the National Association of Soil Conservation Districts and sponsored by twenty-five national conservation organizations, including The American Nature Association. The sessions were attended by nearly three hundred key individuals, the majority being those working on the ground in soil conservation districts, conservancy districts, on watershed programs and the like. The dinner meeting was attended and addressed by the Secretaries of Agriculture, Interior and Army.

At the sessions reports were made by ten committees that had studied and reported on various phases of the watershed program, from the basic elements of a sound national land and water policy to the mechanics of organizing watershed associations. These reports were then subject to discussion from the floor, and we can not recall any meeting at which general discussion was so active, informed and informing.

The committee on a sound land and water policy pointed to the small watershed as "the most feasible approach to such a policy." Indication of the theme of the two-day sessions is to be found in the following quotation from that committee:

"The United States is physically a nation of watersheds, with great river basins sub-divided by numerous tributaries and myriad small streams. The problems of the major river basins are a compound of the resource problems of their lesser drainage areas and can be most effectually solved by going back to this source. The primary upstream watersheds thus become the logical starting point. Nature has fitted them for such a role. Each contains a combination of land, water and related resources, making it a natural operational unit for the conservation, development and management of these resources together. The measures that conserve and improve one resource will reinforce the others.

"The watershed is the collector of moisture in the form of rain and snow, the soil the greatest natural storage for it. Beginning with conservation practices on the land that restrain wasteful water runoff and soil loss, multi-purpose programs can be planned to yield such benefits as erosion control, reforestation, stream stabilization, flood reduction, recharging of underground water levels, protection of farm, municipal and industrial water supplies and increased recreational opportunities. The benefits of more regular stream flow and water delivery, lessened flood dangers and siltation prevention will extend to downstream communities.

"The primary or small watershed is also the most effective approach from the standpoint of people as well as nature. Because it is close to them both, rural and townspeople living in it can see at first hand the mutual benefits they will share in a watershed development program. This unity of interest encourages cooperative action and a willingness to assume local responsibility. The Soil Conservation Districts, watershed associations, conservancy districts, business, farm, sportsmens' and other groups common to the American community provide a readily available leadership to initiate, plan and organize such programs. With the necessary technical assistance furnished by Federal and State agencies and an equitable sharing of costs, the process of Federal, State and local cooperation becomes a working reality."

Elmer Peterson's book underlines these thoughts and sentiments, and trains its guns on the proponents of big dams downstream on the alluvial plains of river valleys. Says this farmer-conservationist:

"Dams on the plowlands fight nature. They do not work with nature. Thus they are disruptive. They are disruptive of the water on which the soil depends. Each new dam, in this disruption, potentially requires that another be built to handle the upsetting caused by the first. And each and every one absolutely requires that another be built to handle the upsetting caused by the first. . .It is a spreading cancer of dams that is the danger, each one nibbling away at the fertility of the land; each one taking men farther away from nature's demand that water be held, not in vast man-made pools, but on the land where it falls."

Mr. Peterson points out that, in the case of water, "we still rely upon the crude techniques of mechanical engineering, disregarding the complex of a dozen other sciences standing ready to help. Particularly we disregard the applied sciences that deal intimately with the hydrologic cycle."

This book is no deep and complicated discussion. It is as grassroots in its treatment of basic conservation as is the program it espouses. It would be possible to quote many paragraphs that highlight the fundamental soundness of upstream control of water. Better, however, one should read this book in its entirety and ponder its relationship to the lives of every one of us.

The small watershed concept has come along fast as a part of the conservation whole. It is tangible; close to the people; logical; simple to comprehend. Through the Hope-Aiken Act it has been given tremendous impetus. It is going to take a long time to do what has to be done on the more than ten thousand small watersheds from which drain our nation's water. But we must get on with it, without delay, and the recent meeting and this new book both show the way.

Bayou du Chien empties into the northern end of Reelfoot Lake in the National Wildlife Refuge. The Corps of Engineers proposes to widen this channel, with the result that it would carry silt from the surrounding farmlands.

Reelfoot, A Dying Lake

By CLEVELAND VAN DRESSER

U.S. Fish and Wildlife Photographs

IN WESTERN Tennessee a lake is dying. It is not just an ordinary lake, and its destruction is an inglorious and unhappy thing. The obliteration of this particular lake will be tragic testimony to the greed of a few men who are privileged to destroy a magnificent work of the Master Artist while the rest of the world stands by in apathy.

Reelfoot Lake is more than just a body of water. It is a symbol, rich in tradition and legend, and blessed with a wealth of natural wonders. As such it ranks in stature with the Yellowstone country of Wyoming, the Carlsbad Caverns of New Mexico and other masterpieces preserved in our National Park system. There is nothing like it in America, or the whole world, for that matter.

Reelfoot Lake is not old, as events are marked by the hand of time. It was "born"—if that is the word—early in 1812, the offspring of a series of earthquakes which sent the Mississippi River reeling backwards. The tortured river temporarily forsook its old channel and created a new one. In the process it inundated a great cypress forest. Eventually the river resumed its old course, leaving Reelfoot Lake as a living token of its brief but epic visit.

In the years that followed, the lake acquired fame as an aquatic wonderland. Waterfowl of every description abounded on its broad bosom; eagles, cranes, herons, cormorants and the ubiquitous blackbirds invaded its great cypress forest, and myriad fishes swam beneath its depths. Teachers and biologists from schools and universities came to study the lush flora and fauna of the region.

And then man descended upon Reelfoot and for more than a century dipped avariciously into its cornucopia of plenty, never thinking of the morrow. Blood was shed and men were killed over the lavish wealth of fish and game produced by Reelfoot Lake, and the wanton destruction of wildlife was appalling. Today,

Erosion in row crop lands along Indian Creek watershed of Reelfoot Lake. Soil conservation is the only answer.

to some extent, these agents of death are curbed, but a new, more deadly killer has been loosed.

This march toward ultimate destruction started during World War One, and has been going on ever since. The killer is erosion, and so far it has reduced Reelfoot Lake from its original 43,000 acres to a mere 23,000. If the present rate of destruction continues, Reelfoot Lake may be nothing but a mass of evil-smelling mud in another thirty years. So far, virtually nothing has been done to halt this calamity.

Thirty-five years ago agricultural prices went sky-high. Farmers on the eastern, wooded slopes of Reelfoot Lake felled their trees and planted the land to row crops of corn and cotton. With utter disregard for soil conservation, they planted their rows running with the slope of the land toward the lake. Erosion started almost immediately, and natural waterways leading into the lake began carrying tremendous loads of silt. Not content with getting water off their hilly land by natural drainage, farmers dug ditches that vastly increased the silt intake of the lake.

Persuading the farmers to practice soil conservation on their sloping land has been impossible. Due to a geological freak, the top soil is very deep. As fast as one layer of soil is washed away, the farmer plows the soil beneath. It is just as fertile, and there is enough of it to last several lifetimes.

Recently I visited Reelfoot Lake to see for myself just how bad the situation was. I have observed erosion in many parts of the United States, but nothing to compare with the ghastly destruction I beheld on the eastern shore of that beautiful body of water situated in the northwest corner of Tennessee. Silt from 100,000 acres of eroding, hilly farmland drains into Reelfoot. The land is so pitted with gullies and ravines in some places that it could hardly be negotiated by a mountain goat. I counted scores of veritable canyons, each large enough to hide several barns, all eaten away by erosion. All the soil that was represented by those chasms had been washed into the lake during the past thirty years. Furthermore, I inspected dozens of huge gravel pits dug into the sides of hills by the State Road Department. They too were depositing silt into Reelfoot Lake.

In addition, drainage from 150 miles of secondary roads and 80 miles of primary roads are adding to the lethal load of silt that goes into Reelfoot every time it rains.

There are four natural channels draining into the lake from the hilly east shore. All are carrying as much silt as their currents can move. Two of them have been widened and straightened to carry more silt. Altogether there are some fifty man-made canals (I counted twenty-three in one

Reelfoot Lake has long been a concentration spot for migratory waterfowl such as these taking wing here.

Row farming like this causes tremendous erosion that is in the process of strangling Reelfoot Lake.

mile) that lead directly from the hillsides to the lake, and they all carry silt.

To get a first-hand look at the results of all this siltation, I spent a day on the lake with an old-time guide. He showed me acres of cattails and caked earth that had once been prolific fish spawning beds. At one point the lake is bridged by silt extending from shore to shore, and the line of muddy water had already reached the magnificent cypress forest that grows at the north end. Aquatic vegetation is slowly being smothered by the ever-encroaching top soil washed from the hills.

From the air (I went over it by plane, too), Reelfoot appears to be in the grip of a many-armed monster that is inexorably turning it into slimy brown ooze. If they had made a garbage dump out of the Grand Canyon it would be no more humiliating. For they are making a cesspool out of Reelfoot Lake. When I finally grasped the composite picture, I wondered how there was anything left of Reelfoot Lake at all.

Fortunately, one-third of Reelfoot Lake is now a National Wildlife Refuge, and a certain amount of protection is afforded that part of it. Farmers can not dig ditches across Federal land, but even so, the U. S. Fish and Wildlife Service states that more than 1000 water acres have already been lost to siltation since 1941, when the refuge was created.

In 1923 the State of Tennessee dug a drainage ditch through part of the lake, with an outlet at the south end. This leads eventually to the Mississippi River. It does not help the situation much, as most of the silt sinks to the bottom before it gets to the ditch. Locks at the head of this canal control the lake level to some extent.

Farmers along the shore have extended planting to include the newly formed land. When the lake level rises, due to rain, they scream for the canal gates to be lowered, claiming their crops are being drowned. In reality, they are farming where the lake ought to be, but they give scant consideration to that. Most of them would like to see *all* of Reelfoot drained, so they could farm the remaining 23,000 acres. It would be mighty rich soil, at that.

Of late, the Army Corps of Engineers proposes to accelerate the destruction of Reelfoot Lake by widening and cleaning the main channel that leads into it from the north. This channel, known as Bayou du Chien, carries little silt into Reelfoot at present. It drains agricultural lands in nearby Kentucky, and, if the Army has its way, it will carry a heavy load of silt.

There is a lot of wrangling going on about construction of silt-retaining basins, at so-called "strategic points," to stop further suffocation of the lake. The most optimistic viewpoint that can be taken about such a program is that the basins will be merely temporary stopgaps. Who is going to empty them when they fill with silt, as they surely will in a short time?

The answer to the Reelfoot siltation problem is obvious—make the farmers quit dumping their silt into the lake. Why has it not been done long before this? The answer is as simple as the question. Too many farmers sit in the State Legislature at Nashville. A bill curbing their activities around Reelfoot would not even get to first reading.

A few years ago the Game and Fish Division of the Tennessee Department of Conservation, which exercises nominal control over the natural resources at Reelfoot, tried to do something along that line. It almost got legislated out of existence for its presumptuous effort. Tennessee politics being what they are, no help can be expected from that quarter.

There is a solution, however. It is a bold and daring one, but not without precedent.

Reelfoot Lake could come under Federal ownership, much as a national forest or a national park. Perhaps the present wildlife refuge could be enlarged to take in the entire land, as well as water area. The eroded hilly farms to the east could be acquired—by condemnation proceedings, if necessary—and the entire offending terrain put back in woodlands as it was intended by Nature, and as it was in the first place.

If such a plan were ever put into effect, it would eliminate another situation besetting Reelfoot Lake that is regarded by many as an evil thing. Commercial fishing for game species is legal in Reelfoot, the only lake in Tennessee where it is permitted. Sportsmen have been fighting this condition for years, but

they have got just about as far in the State Legislature as have the protests against the farmers. Nowhere!

There is yet another little matter that Federal jurisdiction might rectify. As of now, pollution from a score of open sewers pours into Reelfoot Lake in blatant violation of a State law of 1919. The largest town on the lake shore is the worst offender.

We hear much these days about the "give away" program, whereby natural resources, by all moral standards the property of the people as a whole, are being turned over to special interest groups for their particular and personal profit. It seems to me that Reelfoot Lake is an outstanding example of a "give away" deal that has been going on for a long time.

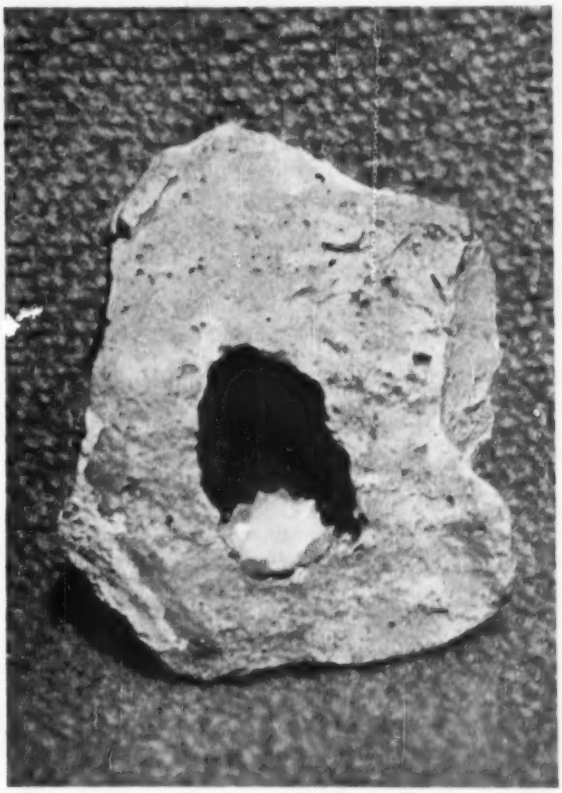
Why should a few farmers be given one of the most beautiful and productive lakes in America to destroy so that they may raise a few ears of corn and a few bales of cotton? Is there not land elsewhere suitable to raise these commodities? Is our sense of values so awry that we must sacrifice a magnificent treasure, rich in esthetic values and natural resources, to feed a few hogs? Must the people of America be deprived of an irreplaceable jewel to satisfy a few grubbers of the soil?

I do not propose that human rights be disregarded in the saving of Reelfoot Lake. Farmers who would be affected by Federal ownership should be fairly and justly repaid. But their desires and selfish interests in the matter should be far outweighed by the interests of the people as a whole.

In the final analysis, if something drastic is not done to preserve Reelfoot Lake, before long it will be another dismal monument to man's destruction. We have more than enough of such monuments already.

Nature-Made "Shrine"

By IDA SMITH



Ben Humphreys of Cashion, Arizona, was hunting for gem opal when he scratched this little shrine-like rock out of the sand. The matrix is rhyolite, a grayish-colored lava. The crystal cluster is "dog-toothed" calcite. It was found on an isolated mountain ridge in central Arizona.

The specimen is a type of rhyolite geode that happened, in the course of geological events, to collect in its hollowed-out center, the liquid materials for calcite crystals. (Calcite is composed of calcium carbonate.) Nature executed the rest according to the plan for these elements, forming her geometrical designs as the moisture evaporated. Scientifically, the crystal cluster is made up of elongated scalenohedrons, which are combinations of right and left-handed rhombohedrons. This is one of the commonest designs of calcite, which has an almost endless variety of forms.

However, common as this design may be, its descriptions, is so complicated that scientists have condensed it to the terms, "scalenohedron" and "rhombohedron," whose root words are universally known.

In simple, but far from adequate terms, a rhombohedron is a solid crystal form that has six equal faces, each a rhomb. A rhombus is a four-sided figure with equal and parallel sides, but two of its angles are pointed and two not pointed. Right and left rhombohedrons are pointed in opposite directions. Combined, elongated, they form the scalenohedrons. These physical and mathematical gymnastics are executed by Nature unaided by man, the science of crystallography having been originated with the birth of Earth's rocks and minerals.

Calcite ranks second to quartz in being the most abundant of minerals. "It is so abundant in the vicinity where I found the little geode," said Ben Humphreys, "that water ditches used by the prehistoric people of Arizona are lined and preserved with the hardened calcite sediment."

Ben Humphreys is a pioneer Arizonan, prospector, Nature student and guide. There is hardly a trail, however obscure, that he has not explored with his jeep. He is also a charter member of the Mineralogical Society of Arizona.

Mr. Humphreys presented the little geode to the MSOA. It is labeled, in tribute to its unknown Craftsman, "The Rock Hound Shrine."

Pitch on the Doorstep

By R. J. RUTTER

Photographs by the Author

The male red-breasted nuthatch on the limb where both parents always stopped before entering the nest with food. This picture was taken before the young were able to come to the nest entrance to be fed. A rivulet of pitch is below the entrance, having run down when it was melted by the sun.

AMONG the mysteries of bird behavior that have defied explanation by students of birds, none is more remarkable than the red-breasted nuthatch's habit of plastering pitch around the entrance to its nest. This curious habit is noted in most of our bird books, but few people have been privileged to watch the whole sticky business, as I was in the spring of 1954, when a pair nested in one of my bird houses.

The red-breasted nuthatch is nearly always found in association with such pitch-bearing trees as pine, spruce, and balsam, but it is by no means confined to a strictly coniferous forest. My observations were made at Huntsville, in the province of Ontario, Canada, lying in the rocky belt of mixed forest that separates the Transition and Canadian life zones. The forest cover here is perhaps two-thirds deciduous, with an attractive sprinkling of the various northern conifers.

We had entertained the red-breasts for several years at our winter feeding station, where they were the most fearless of all our boarders. The chickadees were friendly, talkative little spongers, the woodpeckers and jays suspicious and furtive, but the nuthatches were all business. "Don't bother us," they seemed to say, "we came here to eat and haven't time for talk," and I often amused myself by pushing one about with my finger while it was feeding, without getting any reaction but mild annoyance. Generally credited with a lighter disposition than its larger relative, the white-breasted nuthatch, I think the words used by Bent, in his great *Life Histories*, to describe that species, are quite applicable to this one—"a droll, earnest little bird, rather sedate and unemotional."

In the spring of 1954 I decided to try something new by way of bird boxes. Starting with a block of dead poplar I split it with an axe, gouged a hollow in each side with a chisel, chipped out a groove at one end to form an entrance, and wired the two halves together again. The finished cavity was three inches in diameter and five inches deep; the entrance one and one-eighth inches across.

On March 30 I wired this block to the trunk of a poplar similar to the one from which it had been cut. The nest site was placed six feet from the ground and about fifty yards from the feeding station. Within a few days it was being inspected by both nuthatches and chickadees, and in another week the chickadees had moved on and a pair of red-breasted nuthatches remained in possession.

For a time I was worried because I saw no sign of nesting activity. My work obliged me to be absent a good deal, but on brief visits I saw nothing except the birds themselves, never far away but acting in the most casual manner. Then on April 28, while watching the box in late evening, the male arrived with a small whitish object at the end of his bill. He alighted on a nearby limb, flew down to the entrance, and in about two seconds was away again. Almost at once he was back, and this time I was more alert and saw what was going on. He was bringing pitch from a small balsam twenty feet away and placing his seal of approval on my nest box! The pitch was applied by a light, tapping motion, and was often smoothed on by wiping the bill across it from side to side.

During the next seven weeks I was to see this pitching performance many times, and it was always done just before dark. When young were in the nest it was

usual for feeding to stop about 8:30, or fifteen minutes before sunset. Then there was a recess, perhaps while the parents had their own suppers, then pitching until dark. At first this seemed to be an exclusive duty of the male, but later observation suggested that this was because, when the young were small, the female was more closely tied to other domestic duties.

I do not know just when the nest itself was built. The inch-and-one-half layer of shredded bark, upon which the eggs were laid, meant considerable labor for the builders, but I did not see them bring anything but pitch. It is likely that they worked at the nest early in the morning, as many of our smaller birds do, and most of my observing at this time was in the evening.

Soon after the middle of May the female, who had always kept in the background, disappeared altogether, and I suspected that she was sitting. I tapped on the nest-box, and she came up to the opening to see what the trouble was, but she at once returned to her eggs, and no amount of disturbance would bring her up again. Then, on June 1, on my usual evening call, I found both adults carrying food into the nest. Now the evidence could be assembled to show that the nest had been built in the first half of May, incubation started about the middle of that month, and the young hatched on or about June 1.

The presence of the author and photographer stimulated only watchful curiosity on the part of the female. One of the youngsters may be seen at the nest hole, and a good deal of the pitch deposit may be seen.

At the left the male brings food. Note his widely spread feet, a characteristic of nuthatches. The bird being fed is probably a male because of its more sharply defined coloring, which distinguishes the male from the female redbreast.

Although the birds allowed close observation, it was seldom possible to do more than roughly identify the food brought, beyond the fact that it was composed exclusively of insects. At first it appeared to be tiny flies and beetles, but as the young grew they were fed medium-sized beetles, moths, and other flying insects, up to the size of a horse fly. The parents worked independently, one often arriving with food just as the other left, but the female was the more diligent provider. Occasionally the male forgot his paternal duty and acted as a mere escort to his mate, but these lapses were infrequent.

In the early part of the nesting cycle the

nuthatches had been almost completely silent. Now, as though some tension had been removed, they became increasingly vocal. Their most characteristic note has been represented by various writers as "yank," "quank," "wank," "ank," "yna," and "kng," words that convey little to anyone who has not heard the sound. There is general agreement that it is a reedy, nasal note, and it can only be imitated approximately by the human voice by blocking off the larynx with the tongue and forcing the sound out through the nose. This is the note that the male gives over and over throughout the breeding season, usually in groups of five or six, each note of about one second's duration, and it is the only "song" I have heard. The most common year-round note is audible only up to a few yards, and might be written forty different ways, from "chip" to "ngk." It is almost a tiny grunt, but is much more expressive than that suggests, for these birds depend a great deal on inflection in their language.

The conversation of a family of nuthatches is something else, but written symbols are inadequate. They perform endless variations on a theme that might be vocalized as a musical "ti-ti-ti-ti," but these notes are short or long, high or low, soft or loud, fast or slow, according to the mood of the moment. When father, mother, and several children carry on animated talk, all saying different things with different emphasis, it is a conversational treat. I was surprised to find that the food call of the young was the nasal "yank" of an adult, with just a hint of juvenility. This is in keeping with their appearance, for they look more like their parents than most young birds do when they leave the nest.

The addition of pitch was continued until the young left the nest, and by the time they were half grown there was a generous quantity around the whole rim of the entrance, except for a small area of about one square inch on the right side. An adult approaching with food alighted first at a certain spot on a sloping limb a foot from the entrance, and this procedure never varied. From there it would fly to the bare spot at the right side or, when the young were small, would hover for an instant in front of the hole and dive straight in without so much as touching the sides. The small spot left free of pitch, and this remarkable diving trick, strongly suggest that the birds try to avoid direct contact with the pitch as much as possible.

The perfect method that Nature has devised for nest sanitation, whereby the excrement of young birds is enclosed in a neat white sac, to be carried away by the parents, has a special variation in the case of the red-breasted nuthatch. There was a family of bluebirds in a box on the clothesline pole at the time, and I observed that when the time came the adult bluebird always entered the box and, after a moment, came out with the little white parcel. But when a young nuthatch was ready, it simply presented its rear instead of its front end at the opening. This is an interesting use of the nuthatch's ability to travel

A red-breasted nuthatch on a suet slab, providing a good illustration of how this bird clings with its feet when it is upside down.

head-down as well as head-up. It was always a bird just fed that made the reversal, and here we have a mystery in bird communication. What secret and silent message passed between adult and young? Ordinarily, the parent would cram food into the waiting mouth and leave at once, but at the appointed time it waited. This method was followed only after the young came to the door to be fed, which they began to do on June 12.

Around the nest the female showed no concern over my presence beyond a watchful curiosity. The male was more nervous, and the first time I tried close-up photography he became so upset that he swallowed the tent caterpillar moth he had brought, and fussed around until his wife arrived. When she went ahead with feeding as though nothing was amiss he calmed down, and afterward gave me no trouble. He never would stand for quick or unusual movement as she would, but many pictures were taken at a distance of less than two feet without camouflage of any kind. In contrast to this, an instinctive fear was well developed

in the young, and it was difficult to photograph them except at feeding time. There was room for only one in the doorway, which resulted in much jostling for position, but I was often able to see three, and I believe there were no more.

On June 14 feeding was almost continuous from early morning until near sunset, but the old routine was not broken, and promptly at 8:45 both adults began bringing pitch. They ignored the young, still pleading at the door, and not only added pitch around the entrance but deposited it here and there on adjacent branches. This was the only time I saw the female engage in this work, and, knowing that the nest was about to be deserted, I was filled with new wonder as to the meaning of such a strange rite among nuthatches.

Perhaps it is similar to the ceremonies carried out among some primitive human tribes to mark the change from youth to maturity. Could it be that, long ago, it was decreed that young red-breasted nuthatches must enter the world through a doorway of pitch, to remind them never to wander far from the coniferous trees that had been the friends of their ancestors for so long, and which would provide them with both food and shelter at all seasons? At any rate that fanciful explanation came to me as I watched these strange little birds at their mysterious task, and I was not surprised when I went early the next morning and found that the nest was empty.

Prerogative

By JANE MERCHANT

Why not eat snow? Whatever else
Adult precaution bars
No child should ever be denied
The tingling taste of stars.

The Nene's Comeback

By OTTO G. JANSSEN

THE Hawaiian nene, which seemed to be on the road to extinction a few years ago, appears to be winning its fight for existence.

Thanks to protective measures taken by Hawaiian authorities, the population of the attractive Hawaiian goose is now estimated at sixty-eight. This is small enough, but it is fourteen more than existed four years ago, when the nene population reached its all-time low.

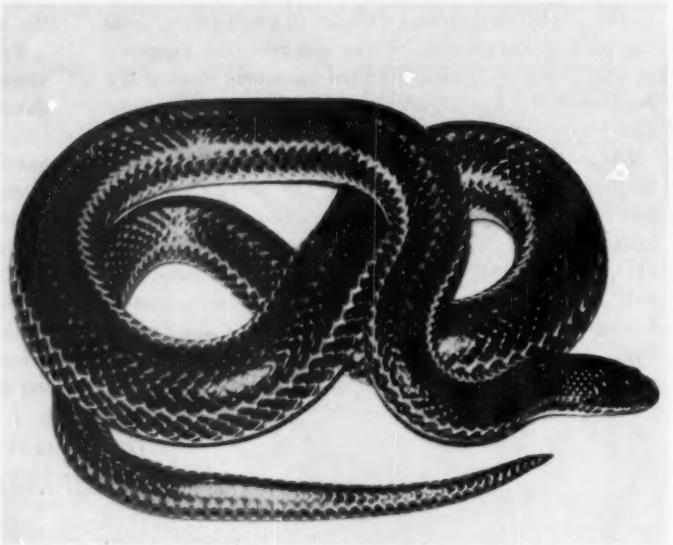
The favorable turn in the nene's fortunes has come about through the establishment of special breeding pens at Pohakuloa, 6500 feet up a mountainside on the volcanic island of Hawaii.

These pens were stocked by nene's loaned by Herbert C. Shipman, a Hawaiian rancher and businessman who was a pioneer in the fight to save the bird. Several young were produced from this flock, but it was not until early last year that Pohakuloa-bred nene's produced young of their own. Four eggs were hatched. The news made page one of the newspapers of America's mid-Pacific territory.

Of the estimated sixty-eight nenes in existence, thiry-eight belong to captive flocks. There are six in Mr. Shipman's flock, fourteen at Pohakuloa, and sixteen at the Severn Wildfowl Trust at Slimbridge, England. The Honolulu zoo has two. An estimated thirty birds are living in the wild state in the mountains of the "Big Island" of Hawaii. All the captive flocks were started from birds from the Shipman estate.

Queen of the Cypress Bog

By JERRY D. HARDY, JR.



The harmless rainbow snake has heavy stripes of deep red painted on a background of iridescent blue-black, with fragments of yellow about the head, and with lower parts of coral and ebony.

It was one of those perfect days of early September. Bill, anxious to find where the perch were biting, walked briskly through the pine thicket, down the gentle slope, and into the cypress bog. Soon he was following the footpath that winds beside Shoe Heel Creek, a tributary of North Carolina's deep, meandering Lumbar River. Suddenly he stopped, awed by a moving thing, which, like a living rainbow, undulated slowly beside a fallen juniper. Then, overcome by a childhood fear, he seized a heavy branch from the mud and began beating the rainbow until it was nothing more than a broken mass of colors, all mingled together in the rich, mossy earth of the swamp.

What he had seen and killed was a type of snake that, for its magnificent color and pattern, has been given the most esthetic name of any North American reptile—the rainbow snake, *Abastor erythrogrammus*. This name is justified by the heavy stripes of deep red painted on a background of iridescent blue-black, with fragments of yellow about the head, and a stomach the color of coral and ebony. It is a thoroughly harmless creature. Yet it is constantly persecuted throughout its range, which includes swamps, marshes, and sandy places in the southeastern states, from Maryland to Florida and Alabama.

This particular rainbow snake, killed on a September day, was an old female. Six years ago she had begun her life on a knoll overlooking the cypress bog, where the cool breezes now whispered in the pine trees and the gray squirrels scampered hurriedly from scrub oak to scrub oak, constantly aware of the coming of winter.

At first there had been only a minute mass of multiplying cells deep within the body of a mother snake. Then the mother, following an ancient instinct, had gone to the pine knoll and made a hollow nest in the sand. Here, on a humid afternoon in early July, she had rid herself of her eggs. Gradually the tiny embryo grew until her new-formed muscles flexed spasmodically to overcome the discomfort of the encircling leathery shell that held her captive. Then one day, when the sun had heated the sand above the nest to a pleasant, even warmth, she pressed hard against the wall of the prison until it cracked and she was able to drag her moist, nine-inch body into the freedom of the nest. Here she lingered only long enough to shed her embryonic skin. Then, satisfying some sudden urge to go beneath the surface, she entered an earthworm burrow and followed it eagerly downward into the earth.

Nature has a perverse way of hiding much of beauty. Thus the pearl is lost in the lightless hollow of an oyster shell, and the lavishly ornamented young of the rainbow snake are known to the worms, insect grubs, and occasional shrews met in the darkness of the earth. Here the rainbow feeds upon the host of succulent soft-fleshed earthworms, creators of the tube-like tunnels through which the snakes travel.

For many months the young rainbow stayed hidden beneath the ground, sometimes forcing her way twenty feet below the surface, where the cold air could not chill. Eventually the winter passed and the warmth of early spring drew her upward. One night she climbed out of a rodent burrow beside a giant fern, to view for the first time the world of air, green things and moonlight.

Some instinct urged her down the gentle slope of the pine knoll to the watery cypress bog. There she thrust her head beneath the duckweed of a small pool and sucked in refreshing mouthfulls of the sweet, cool water. She had drank before, but only of the rain water that seeped into the dark earth. The pool was a fascinating place, and the snake pushed slowly into its liquid substance until she swam freely beneath the surface.

Presently the rainbow was aware of a gnawing hunger, and of a slender, black creature with tiny, useless legs. It seemed to hang like a shadow suspended in the water. A sudden surge of energy propelled the snake toward the lesser animal and her jaws snapped shut just behind its disproportioned front legs. Both creatures were instantly alive with energy, fury, and fear as they lashed about the bottom of the

pool. The sharp-toothed mouth of the prey tore painfully at the captor's tough, scaly hide, but the insatiable need for food would not allow release. Finally the battle ended and she dragged the limp, living body of her captive to a mossy ledge beside the pool. There, quite slowly, she swallowed her victim, head first and whole.

Thus it was that she had eaten her first meal of the favorite food of rainbow snakes—the Congo eel, one of the most bizarre and interesting of the caudate amphibians.

This, then, was the pattern of her life. She would wander from the pine knoll to the cypress bog in search of food, then back again to the shelter and security of her burrow in the world beneath the sand. Her infant diet of earthworms was now forgotten, and she fed almost exclusively on the strange, short-legged salamanders. Occasionally, however, when neither eel nor amphibian was in the pool to satisfy her hunger, a scaly fish became her fare.

Gradually she came to know the other denizens of her world of sand and pine trees, cypress and water. Some she regarded with casual indifference; others she instinctively avoided. Among those that were neither good nor bad, but simply a natural part of her surroundings, there was the large, slick-furred otter, which now and again invaded the quiet water of her pool, frightening one and all of its inhabitants into secret hiding places among the swaying water grass and twisted cypress roots.

The large turtles, some green, others red, black and yellow, were an odd lot. They would spend hours floating between the worlds of water and air, only to become suddenly aware of life and swim downward through the water to nibble leaves and branches from the delicate, pastel-tinted water plants.

The strangest pool-creatures were the tiny smooth-skinned beasts that were neither fish nor succulent Congo eel; too small for food, yet large enough to be noticed. Never would the snake realize the intricate parent-offspring relationship between these swimming, gilled things and the frogs that, by day, hopped about on the land and bathed in moonlight, floated turtle-wise on the water, swelling their throats into giant bubbles and screaming love songs into the night.

There were other snakes like the rainbow, and still others not like her. Of these, there were the musky smelling water snakes, which stole fishes from her pond, and the yellow rat snake, all lemon-colored and striped with chocolate, which she had seen only once as it hung head downward from an abandoned thrush's nest. Until that day the birds had been there, guarding and warming their eggs; now they were gone.

The pine forest had its own special little people. These were the fleet-footed racerunners, which sometimes dived into her favorite burrow, and the fence lizards that clung tenaciously to the rough-barked trees and regarded her with great curiosity as she went to or from the cypress bog.

Once the rainbow had had a friend, a timid little white-footed mouse that lived in a hollow beneath an ancient oak tree. Each night he would scamper homeward, past the entrance to her burrow, along an invisible rodent trail. One night he passed by hastily, squeaking as he went as though frightened by an unseen enemy. Then a giant thing, all feathers and brown, with yellow eyes that seemed the size of lily pads, swooped down out of the moon, following the invisible trail. Presently, in the darkness near the acorn tree, there was a rustling of leaves, and the giant thing flew back into the moon, carrying in its talons something limp. After that she never saw her little friend again. The cypress bog and the pine knoll were strange places and full of mystery.

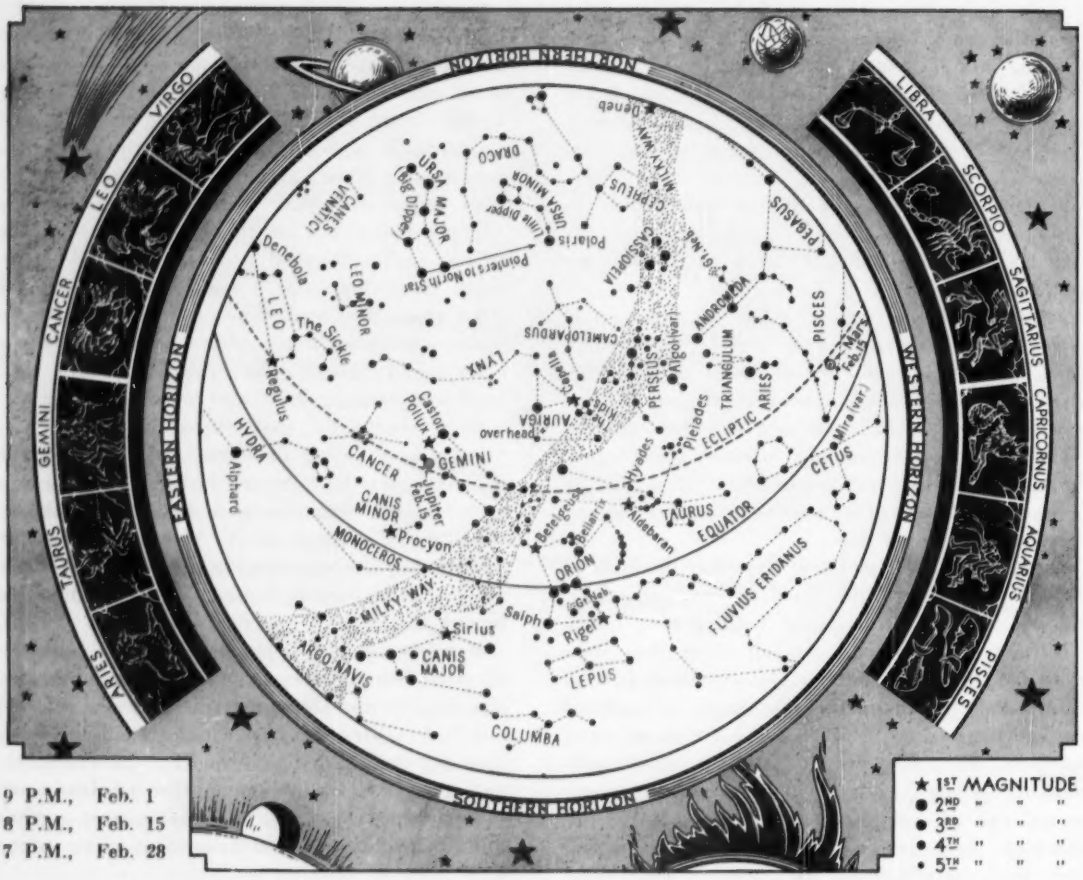
Some things the snake instinctively feared. One was the king snake, all banded with streaks of frozen lightning on a background darker than an angry sky at midnight. Its eyes were filled with hunger and cunning and seemed always to stare at her. Sometimes, when she was crossing the pine knoll, he would follow, racing rapidly behind, until she dived into a burrow to escape.

Rainbow snakes apparently do not hibernate as do other North American snakes, and thus it was that one day, in mid-December, the queen of the cypress bog had crawled slowly down to the edge of her pool, then icy cold and devoid of life. Suddenly, a thin, half-starved hawk, seeing another rainbow near the pool, dropped down out of a leafless tree, grabbed the other snake in its claws and carried it off for its evening meal.

There was still another enemy—man, a virtual monster among the beasts. Once a fisherman had stepped on her as she slumbered in the sun. Fearing for her life, she had thrust the sharp point of her tail into the soft flesh of his ankle, and he had run off screaming that he had been stung by a horn snake and would surely die.

This misinterpretation of the harmless tail spine found on all rainbow snakes is the most widely believed superstition regarding the species. Actually this spine is nothing more than an enlarged, hardened scale that is used both defensively and in subduing prey. Folklore has credited it with being highly poisonous. Not only is it supposed to kill man and beast but also trees accidentally struck by it. Thus many harmless rainbow snakes fall victim to the monster enemy.

One day, rather early in her life, the young rainbow had become suddenly aware of a new instinct, a strange attraction to one of her kind. She was wooed and won in the cypress bog. Early that July the same ancestral urge that had led her mother before her guided her to the pine knoll and into an abandoned burrow. She hurriedly scooped out a little chamber four inches high and eight inches long, lying just a half-foot beneath the surface of the warm sand. Into this she deposited thirty-six white, (Continued on page 108)



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

Isabel Martin Lewis

By RICHARD W. WESTWOOD

IN THE December, 1923, issue of *Nature Magazine* there appeared an article entitled "Two Famous Groups of Stars." It described and pictured the Hyades and Pleiades in Taurus. The article was signed by Isabel M. Lewis, who was identified as being with the United States Naval Observatory. In the issue of May, 1924, Mrs. Lewis wrote again, this time under the title of "The Evening Skies in May," thus launching a series of monthly astronomy articles, with accompanying map, that have appeared regularly ever since.

During these thirty years, Mrs. Lewis provided inspiration and valuable information to countless amateur astronomers. She introduced the fascinations of the universe to many, young and old, who might otherwise never have learned to read the story of the heavens. She has thus rendered a singular public service and made a great educational contribution through our pages.

It has been the privilege of this writer, as editor, to work with Mrs. Lewis through these three decades. Now and then he has realized that, one day, she would find continuation of this series a burden, but the editor has always pushed that thought away to the repository of things upon which one wishes not to dwell. The day has finally arrived, and Mrs. Lewis now finds it physically impossible to continue.

It is not easy to find a successor for our astronomy contributor. And her decision was forced upon her quite suddenly, so that such successor could not immediately be discovered. We welcome the opportunity, therefore, to tell readers, of both long or recent standing, something about Isabel M. Lewis.

Isabel Eleanor Martin was born in Old Orchard, Maine, and we know she will not mind our recording the date as July 11, 1881, for it is freely stated in

Who's Who in America. Attending Cornell University, she there received her A.B. degree in 1903, and her M.A. in 1905. As a graduate student at Ithaca she was specially interested in the mathematical theory of eclipses. This concern attracted the attention of Roberdeau Buchanan of the Nautical Almanac Office at the U. S. Naval Observatory in Washington, D. C. He recommended Miss Martin to the astronomer Simon Newcomb, who employed her privately as a computer from 1905 to 1907, during which period she served for three months as a miscellaneous computer in the Nautical Almanac Office.

Employment of women in this office was not a favored practice at that time, so our young eclipse authority was not encouraged as to the possibility of a permanent assignment. In 1908, however, and as a tribute to her abilities, Isabel Martin was given a regular appointment and became the first woman in the Almanac Office. From then to 1912 she held a full-time position, and in the latter year married a colleague at the Observatory, Clifford S. Lewis. From the time of her marriage until 1927, when her husband passed away, Mrs. Lewis served as a part-time, piecework computer, the meanwhile caring for her home and raising a son, Robert Winslow Lewis.

After the death of Dr. Lewis, Mrs. Lewis returned full-time to the Observatory, being classified as astronomer from 1930 until her retirement on July 31, 1951. Thus Mrs. Lewis was associated with the Nautical Almanac Office for 43 years, at one time or another assisting in the computations for practically every section of the *American Ephemeris and Nautical Almanac.* Her major work, however, was in the calculation of eclipses and the occultations of stars by the moon. By 1932 she was formally in charge of eclipses and occultations. By the time of her retirement Mrs. Lewis had completed the calculations for all the eclipses through the year 1954. Her final article, in the January, 1955, issue of *Nature Magazine*, forecasts these events for 1955.

"Over this period of service," says a record of Mrs. Lewis' work compiled by the Naval Observatory, "Mrs. Lewis contributed effectively to the improvement of the methods of calculation used in the Almanac Office. She developed a method for computing the north and south limits of the region of visibility of a total solar eclipse more accurately, and yet with less time and labor, than by the method that had formerly been in use. When the investigation of phenomena in the ionosphere began to be important, she developed formulae for computing solar eclipses at ionospheric levels. She devised a method of determining corrections to an eclipse prediction at a particular location in order to obtain a prediction for a nearby place with comparatively little labor. When occultations became of increased astronomical importance for the investigation of irregularities in the motion of the moon, and the Almanac Office was under the necessity of greatly increasing the number of occultations that were predicted, she devised improved procedures for this purpose. In addition, during the period of transition in the Almanac Office from the former logarithmic methods of computation to the electric desk calculating machine, Mrs. Lewis modified the systematic methods and formulae for the computation of eclipses to adapt them to machine calculation, and introduced many improvements in detail."

Because of her concern with eclipses, Mrs. Lewis participated in the solar eclipse expeditions that went to Russia in 1936, and to Peru in 1937. She reported on both of these in her articles.

It is the testimony of her colleagues that Isabel Lewis established exacting standards and set an example of industry and interest that were guides and inspiration to workers who came under her supervision.

Many technical papers on astronomy appeared under Mrs. Lewis' name in scientific journals. However, she possessed a special ability to tell the story of astronomy in simple terms, and was the author of many popular articles, in addition to her regular department in *Nature Magazine.* She was also the author of three books—*Astronomy for Young Folks* (1922); *Splendors of the Sky* (1919); *Handbook of Solar Eclipses.*

To an editor Mrs. Lewis was a constant joy. She had an abiding respect for deadlines. Her articles were clear and concise. Editing was rarely necessary, save for the contribution of an occasional comma in the interest of clarity. Thus it has been a notably happy writer-editor association that is now sadly terminated after more than three decades. We are going to miss Isabel M. Lewis mightily. And, since we have the last word, we want to say that she was mighty sweet, too.

Have Faith

By ELEANORE FARRAND ROSS

Is that a star
Sending its beam above
The sunset's bar?

Or is it a light
From some plane piloted
Through coming night?

Are those the wings
That in war's grim futility, bring death
To earthly things?

The human eye
Cannot discover any motion
In dark'ning sky.

* * *

It *is* a star!
Finding its destined course
In pathways far.

The Deity,
Who planned the march of constellations
In harmony,

Still reigns supreme;
Above the travail of the Nations
The Star's bright beam!

The School Page

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

BALANCE SHEETS

SINCE this issue of the School Page is due to appear as January departs and February begins, it is reasonable to assume that some persons will be going through a period of evaluation of what has happened in the past. New Year's resolutions to begin a diet may or may not begin to show results. Income taxes and their hectic reports are just around the corner. A new year is beginning to stir the birds, the buds, the bugs and even life in the burrows. Why, then, should we not devote this page to a brief summary of some of the things that have happened to help teachers of Nature, Science and Conservation during the past year? We cannot begin to cover all that has happened, but we can at least mention a few things.

It happens that this particular topic was selected because of the arrival of Number 1, Volume 1 of the *Kansas School Naturalist*, published by the Emporia, Kansas, State Teachers College, with the support of President John King, and under the leadership of Dr. John Breukelmann. This new school quarterly is available to Kansas school folk, and should perform a most useful service to the schools of the State. Kansas has ranked high for its publications useful to naturalists, particularly because of those coming from the University of Kansas. It is appropriate that the State offer to the pre-college teachers material suitable to their needs. Instead of providing a competitive service, these school leaflets should serve to put into use the findings of the more technical publications of the university.

The initial *Kansas School Naturalist* helps teachers use as laboratories their school windows, and the cover cleverly shows what may be seen looking out of and into an ordinary schoolroom window. Drs. King and Breukelmann, and the State of Kansas, are to be congratulated on this new venture, which was, in part, the outcome of a teachers' workshop sponsored last summer at Emporia by the National Wildlife Federation.

Another mid-West workshop in Iowa, also sponsored by the Federation, was responsible for that State winning an award for outstanding service to conservation.

It is possible that this whole movement, gaining momentum in the mid-West, may find expression in September in a general workshop sponsored by the National Association of Biology Teachers. This is similar to the successful project that NABT initiated at Gainesville, Florida, last September. The Gainesville project was sponsored by the American Institute of Biological Sciences, conducted by the National Association of Biology Teachers, and financed by the National Science Foundation.

Dr. John Bulger of the National Wildlife Federation has been responsible, during the past year, for some excellent publications that should be useful to teachers. This project was a joint effort of the Federation and the Outboard Boating Club of America. The series might be called the "Let's Do Something About Conservation" series. It consists of monthly, four-page folders reporting things that have actually been done by average groups of people, young and old, to make the environment more hospitable to fish and wildlife. The demand for these publications from Scout groups has been phenomenal, and at times has threatened to "break the bank," but that situation only supports our belief that they have general merit.

A survey of the past twelve months should certainly call attention to the conservation project sponsored by the Boy Scouts of America as an outgrowth of the conservation work at the Jamboree in California for the summer of 1935. Unfortunately, the reports of what was done nationally as a result of this activity is not available at this time. Local reports are only beginning to be made as this page is written. Judging from reactions we have had, however, it would seem that the Scouts have really done something this time that is not academic, not purely recreational, but truly practical. We congratulate them, and anticipate that they will be able to carry on their plans for increasing their effort in this direction.

We reported earlier on this page about the work done at the Copenhagen meeting of the International Union for the Protection of Nature, last August. Correspondence from members of the group from many nations would indicate that the ideals of the organization are beginning to be applied. However, there are few projects with which I have been identified where there is less uniformity of development. Some nations are doing a great deal and others almost nothing. Nevertheless, getting along with Nature is truly an international task, and unless we can work together on it we will find our tasks increasingly difficult so far as our own local interests are concerned.

Any summary of this sort should mention new publications of the pamphlet type useful to teachers. One such is *A Manual on Conservation of Soil and Water, A Handbook for Professional Agricultural Workers*, published by the Soil Conservation Service of the United States Department of Agriculture as Agriculture Handbook No. 61. This 208-page booklet, written for agricultural workers, should be most helpful to the average teacher interested in managing the outdoors.

The Conservation Foundation has performed a useful service in the publication of *The Plymouth Experiment*, by Arthur S. Rollins, which was the outgrowth of a workshop organized under the direction of Dr. Rollins at Plymouth, New Hampshire. In part as a result of this project, the annual meeting of the Conservation Education Association will be held at Plymouth next summer. The Association held its annual meeting in Laramie, Wyoming, last August.

Shortly there should be in print the *Handbook on Teaching Conservation and Resource-Use* developed by the National Association of Biology Teachers with the help of a grant from the American Nature Association. Here is one project that really worked and has been followed through to a point where something concrete can be laid on the table for anyone to see what a fair cross section of practical conservation and biology teachers are thinking about in this general field. Someone eminently qualified to know has said that it is doubtful if many similar projects have brought so great a return for the money and effort expended as did this one. It is possible that the Gainesville report, when it comes out, will be equally useful. In both of these projects much credit should be given for the drive and energy of Dr. Richard Weaver of the University of Michigan, and those who worked with him, particularly Dr. Harvey Stork of Carleton College, Minnesota, and Dr. Sam Mayer of Tallahassee, Florida.

In any summary of this sort we cannot overlook the growth in interest manifested by new projects in Montana, by the publication of the *Conservation Handbook for Teachers of Idaho*, and certainly by the publication of *Nevada Conservation Adventure, a Textbook for Use in the Public Schools of Nevada*, and the *Manual of Southern Forestry* by Dr. Howard Weaver and David A. Anderson of the Texas Forest Service.

A quick summary of the States mentioned in this report shows a healthy, widespread interest in helping teachers do a better job in teaching natural history. We hope that another year may show even greater progress. With the new Congress opening we have a Democratic Congress and a Republican executive branch of our government. Certainly the immediate and remote future demand level heads in all areas of human affairs. It is hoped that teachers may make a major contribution to the situation. That their leadership is needed should be obvious to anyone, and that there are those willing and able to help them has we hope been shown by this School Page.

Western Reptiles

Amphibians and Reptiles of Western North America. By R. C. Stebbins. New York. 1954. McGraw-Hill Book Company. 528 pages. Illustrated by 104 plates, 52 figures (more than 300 separate illustrations, including maps. $8.50.

This new volume on herpetology is a distinguished contribution to the publisher's field guide series, and the author has set a new standard of natural history art in this copiously illustrated contribution to the fields of biology, distribution and classification of the western cold-blooded animals.

The author's original objective, that of preparing a book suitable for beginners and non-herpetological students of natural history, has been so well achieved by means of the illustrated keys, maps and full-length portraits, that any one of average intelligence should be able to make rapid and accurate identification of any western cold-blooded vertebrate he may capture.

All of the known species of western United States amphibians and reptiles are illustrated by drawings taken from living animals, and wherever interpretation of the terms used in the keys seems difficult to understand, the technical details are illustrated by exceptionally good line drawings.

The author's painstaking and thoroughgoing work has resulted in a book that will serve the elementary students and will also constitute a landmark for advanced and professional students as well.

There can be little doubt that this summation of the current knowledge of the biology of amphibians and reptiles and their distribution, will serve as a new basis or starting point for both elementary and advanced students in search of information on the status of either specimens or observational data on ecology, life cycles, or behavior. The availability of an up-to-date review of what is already known, and the facility with which these animals can now be identified, will enormously stimulate and encourage young people from whose ranks we must recruit the serious students.

With the publication of this book western herpetology should receive a strong new impetus. For the first time the western half of the United States has a compendium of knowledge on both the amphibians and reptiles, combined with keys, illustrations, and distributional maps that expedite classification. For the beginner somewhat uncertain of his diagnosis, the book provides the necessary checks that should give him assurance and a feeling of independent accomplishment from having worked out an identification for himself.

Although it may be a minor source of disturbance to some advanced students of herpetology, others may agree with the author's conservative treatment of generic and specific categories within some of the groups of our western fauna. Similarly there will doubtless be some professional workers who may find the separate treatment of species and subspecies to be awkward. However, it should be realized that a book such as this could not be designed to serve all levels of students equally well, and that thus there necessarily would be some compromises.

From the standpoint of teachers who have watched beginning students insist on attempting to key out some of our subspecies from a single specimen, the Stebbins' treatment seems admirable. The arrangement should serve to correct the delusion that all specimens of subspecies should be easily and infallibly keyed out, and it should serve to emphasize the importance of the subspecies as representing a dynamic, plastic population of animals responsive to the environment and to their heredity.

Whatever criticisms may arise from different points of view and different interests in this field, it cannot be denied that any one working in the field of herpetology will find this book essential to his library, and he will also welcome and admire the artistic merits shown in each of the hundreds of hand-drawn illustrations. There is only one photographic plate in the volume.

This reviewer believes that the magnitude of the task represented by the compilation of this book, and the artistic merit of the drawings will long defer the appearance of similar work by other authors. Raymond B. Cowles

Florida Shells

Shells. Edited by Mrs. Hugh Branham. St. Petersburg, Fla. 1954. Florida Speaks Corporation, 1424 Fourth St. S. 37 pages, with 400 shells illustrated in color or black and white. $1.00.

Almost everyone who visits the beaches of Florida is fascinated by the shells found there, and many wish to know more about these shells. There are, of course, excellent shell guides, but this little booklet will slip into one's pocket and be immensely useful to the sheller, casual or otherwise.

Prehistoric Animals

Prehistoric Animals. By William E. Scheele. Cleveland, Ohio. 1954. The World Publishing Co. 126 pages. Illustrated by the author. $4.94.

In this interesting and valuable book, the author, who is director of the Cleveland Museum of Natural History, presents an essentially pictorial history of life on earth. He starts with brachiopods and ends with dinosaurs. The text that accompanies his illustrations is presented in popular terms and briefly. Here, indeed, is a book that will be sought by every school library where the school devotes classroom time to prehistoric animal life.

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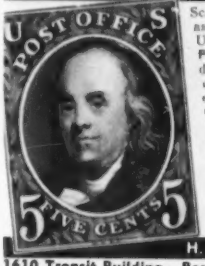

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Camera Trails

By
EDNA HOFFMAN EVANS

THE other day I was reading about Paul Bunyan, the superman lumberjack hero of the North Woods, and I ran across an anecdote that really "rang a bell" with me. It seems that Paul turned inventor one time during a slack season in the lumber camp. Among the other things he invented was a patent-action, double-guaranteed Day-Stretcher that he put together so that he would have more time during the day to catch up on his work.

The Day-Stretcher worked pretty well, and, by adjusting a cog here and putting a little oil on a flywheel there, Paul was able to stretch a day until it was twice as long as usual. The only trouble—as he discovered after he had the contraption working at full blast—was that when the days were twice as long, he got just twice as far behind in his work.

So Paul Bunyan, being nobody's fool, cut the power, junked his Day-Stretcher, and sold off his extra-long days to a second-hand dealer back East. Those long days are still in circulation, you know, but somehow they do not seem to do anybody any good. The next time a Blue Monday rolls around, or when the hours between getting up in the morning and going to bed at night seem endless, you can be sure that one of Paul Bunyan's extra-long days has been slipped into the calendar.

I seem to have had more than my share of those extra-long days lately, and, just as Paul Bunyan did, I find myself twice as far behind as I do on normal days. Particularly do I notice the effect on my accumulation of mail. The pile of incoming, unsorted advertisements, circulars, informational material, letters, and what not has gotten too high for me to see over—let alone read and (sometimes) answer promptly. As was the case with those double-stretched days of Paul Bunyan's, I am glad the mail man comes by my door only once a day. If he called twice, I would be doubly behind in my correspondence.

It has reached the place where something has to be done about it. So today, in one titanic, super-human effort to get out from under the great accumulation of informational mail, I have finally talked myself into attacking the heap and doing something about it. After several hours of patient (and sometimes impatient) sorting, I have reduced the large pile of photographic information to three smaller ones which I have designated as: (1) worth reporting on; (2) maybe; and (3) a large, untidy mess on the floor destined for the wastebasket. The following is a sampling from the "worth reporting" section.

The Kodak Technical Close-up outfit is designed especially for making good close-ups of flowers and other small objects. Everything appearing within the metal "1" of the focal frame will be sharp and well illuminated.

Technical Close-ups.

With a view to making precision close-up color photography considerably easier, the Eastman Kodak Company has developed a new, technical, close-up attachment. It can be used, according to the company's report, by camera fans, gardeners, stamp collectors, Nature lovers, in fact by anyone with or without photographic training who wants to produce color transparencies of maximum quality with a minimum of difficulty.

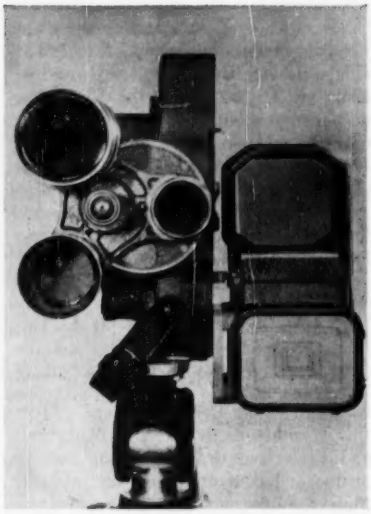
This tiny Minox camera, not much larger than a fountain pen, was originally designed for espionage purposes. It has built-in filters, an f 3.5 lens, and shutter speeds up to 1/1000th of a second.

The outfit is built around a simple, sturdy frame to which camera and flashholder are attached. A half-frame is mounted out in front of the camera on two arms that extend from the plate. The mounting plate holds the camera rigidly and accurately, and sets the flashholder in position so that the light is beamed accurately. The half-frame in front of the camera outlines the field of picture coverage—3 x 4 inches at a distance of 6 inches. To locate the camera at the correct distance, the operator merely places the frame at the subject area to be photographed.

Use of the half-frame rather than a whole frame eliminates the shadows that a full frame would cast when the camera is used outdoors. The half-frame is clearly marked with dots and notches that indicate accurately the slightly different fields of coverage of the 35mm and 828 camera, so that the operator can visualize the exact center of his picture.

The frame attachment is designed to accommodate a Kodak Pony 828, or a Pony 135 camera; a Kodak B-C flashholder is recommended as a light source. A special flashguard is provided to protect the subject from heat and possible shattering of the flashbulb. This flashguard also reduces the light intensity to 1/10 of normal brilliance, the correct lighting for extreme close-ups. The flashholder is located slightly to one side of the camera to produce better light modeling and to give good roundness and detail.

The attachment is offered in two forms. The one for making close-ups with a Kodak Pony 135, Model B or 828 camera,



With a Spider Turret (left) and a Sports Finder (right) installed on a Bell and Howell 70-DL 16mm motion picture camera, the photographer can follow fast action with any desired combination of telephoto or wide-angle lenses.

is called the Kodak Pony Close-Up Kit. Priced at $19.95, this includes the framing attachment, supplementary lens and filters, and special close-up flashguard. The other, called the Kodak Technical Close-Up Outfit, priced at $62.75, includes the kit, a camera, and attachments.

Needless to say, this principle is not new. Photographers have concocted numerous close-up focusing devices out of wire and what-have-you. But this Eastman device is the first of its kind, so elaborately thought out and prepared for marketing, that I have run across. If he did not wish to buy one, an ingenious close-up fan could easily construct his own.

Spider Turret.

Along somewhat similar lines, in that it is designed for movie close-ups, is the Spider Turret for the Bell & Howell 70-DL 16mm movie camera. The turret is described as permitting an unlimited variety of lens combinations to allow switching from close-ups to extreme close-ups. Any three lenses from 0.7 to 6 inches in focal length may be used without optical or mechanical interference. For example, an 0.7 inch, a 4-inch, and a 6-inch lens may be mounted simultaneously. The turret is said to be especially effective when used by outdoor photographers to bring distant objects up close.

Another accessory, which may be used separately, or in combination with the spider turret, is the Sports Finder. This is a giant reticle finder with 1, 2, 3, and 4 inch fields clearly marked so that the photographer can see the action outside the "taking area" as well as that covered by the lens in use. Thus, in wildlife photography, the cameraman can see other possible subjects or sources of interference at the same time that he is concentrating on the main actor.

Both accessories, the company claims, are "firsts" for a standard 16mm movie camera. The Bell & Howell 70-DL camera comes equipped with turret and finder, and the accessories may also be installed on 70 cameras already in use. Prices are $85 for the Spider Turret and $125 for the sports finder installed on a new Bell & Howell 70-DL camera. Installing the equipment on cameras already in the field costs $95 for the turret and $125 for the finder. Both are factory installations. For further information contact the company at 7100 McCormick Road, Chicago 45, Illinois.

Cloak And Dagger Special.

Here is a high-priced little novelty that appeals to me only after I have hiked for a couple of miles carrying ten or twelve pounds of camera and equipment.

The Minox camera, developed originally for espionage purposes, is now available to the ordinary purchaser—if he has the price, that is. It really is a fabulous little camera, so small and light that it can be carried in the pocket like a fountain pen or cigarette lighter. It measures one inch by three inches by 5/8-inch, features an f/3.5 15mm focal length lens, and has a focusing range of from eight inches to infinity. The Minox has automatic parallax correction for all distances, eleven shutter speeds from ½ second to 1/1000, and also has built-in green and orange filters.

More fabulous still, one model of the Minox is gold-plated, comes in a genuine alligator leather case, and has a gold-plated measuring-safety chain. The price—oh yes, that model costs $300. For less well-nourished pocketbooks, there is another model—satin chrome finish with leather case and chrome chain—that retails for a mere $139.50.

Available at some dealers throughout the country, the Minox products are distributed by Kling Photo Corporation, 235 Fourth Avenue, New York 3, N. Y.

Microprint Reader.

It is a never-ending source of pleasant amazement to me the number of fields in which photography may be found. Take the war-developed system of reducing records, books, and all sorts of written material to almost microscopic size. As many as sixty standard book pages can be reproduced photographically in miniature on one side of a standard 3 x 5 inch card.

To return this material to readable size, the Eastman Kodak Company has developed a new Kodagraph Microprint Reader for use in offices and libraries. The microprint material is projected on a green-tinted, 8¾ x 10½-inch screen from whence it can be read, often with greater ease than could the original material. The whole device is somewhat larger, but weighs about as much as an ordinary standard-size typewriter.

Of course, it is nothing an amateur photographer would care to purchase, but

(Continued on page 107)

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THE CLIMBING FERN

(Continued from page 76)

vines remain evergreen all winter in North Carolina. Early in autumn they are at the height of their beauty.

Lygodium palmatum has been found in most eastern States, from New England to Florida, as well as in Ohio, Kentucky and Tennessee. I have seen it growing in profusion in isolated patches in the Blue Ridge Mountains, and learn that it is also rarely found on the coastal plain. It was not discovered in North Carolina until the latter part of the 18th century. One marvels at the way the ice age distributed plant life, and it was no surprise to me to find the climbing fern in this southeastern section of the United States, as it is the country's most densely populated plant area, producing other rare plants, fast disappearing with civilization invading the coves and mountain tops. My experience has taught me that *L. palmatum* likes fairly shaded, low woods, but a moist, highly acid soil. Although its habitat is chiefly along stream banks, I have also located it in limited quantities on open mountain slopes at the edge of a thicket. It lives in company with the royal fern, the turkey brush and Galax. I recall guiding a group of fern enthusiasts through timber rattler territory to a spot where I first found this fern under huge oaks, lovely hemlocks, *Halesia*, and *Chionanthus*, hugged by *Leucothe*, *Wahoe*, *Kalmia* and *Rhododendron*. This particular area has not been burned over, as have so many of our forests, which may account for the fern's survival here and its disappearance in other less fortunate sections of the country.

Do not pick the fertile fronds of ferns, which will produce future plants. If you must gather any ferns, choose only those that do not bear spores. And if you, too, may find *Lygodium palmatum*—one of America's beautiful plants—preserve it for the enjoyment of future generations.

BIRDING MOMENTS IN MEXICO

(Continued from page 75)

white and striking.

The honking of the horn brought me out of the woods.

"All fixed," my son announced, "Mended the tank with soap!"

Months of searching in museums and books went by before my friend, L. Irby Davis, a fine field student of Mexican birds, told me I had seen the banded wren. He found a picture in an old *Condor* and asked about the other bird, "Is this it?" I was thrilled to recognize my bird of the bushes in Grayson's painting of the red-breasted chat. I consider it the rarest bird on my list. But in my mind the exotic creature is always associated with tortillas and eggs—and soap!

•

In Tapalapa—A village of mud huts clustered around the ruins of an enormous old monastery, in the mountains of Chiapas.

RIDING my hobby by muleback was tantalizing. I longed to stop and camp a few days in the paradise through which we were steadily jogging along. I could not hold up the caravan every time I glimpsed bright wings in the jungle or heard strange songs. Words from the page of an old autograph album kept ringing in my mind:

"The birds around me hopped and played;

I felt a thrill of pleasure. . . "

and I added to them,

"The mule-train must not be delayed;

We're subject to a schedule!"

I did hold up the crowd one day when I spied a white hawk, most beautiful of his tribe, perched across a ravine from our trail. A black sub-terminal band in tail, and black wing patches show in flight, though if the bird is soaring high overhead it appears all white. This handsome hawk is nineteen to twenty-two inches long.

From the mule's back I also made the acquaintance of the rufous-collared robin and the paraque—thanks to *their* cooperation, not the mule's.

We stayed in the Zoqui Indian village of Tapalapa a couple of days, and my bird walks there were rewarding. The last morning I asked my husband what time we were leaving. "I've ordered the mules for seven-thirty," he said, "so maybe by eight they will be here." I said to myself I probably would not hold up the party if I got back by eight-thirty. On my agenda were several half-identified birds I was anxious to see again—a new hummer called the green violet ear, a puzzling sparrow of the upland meadow, a new wren with a brilliant song but very under-handed habits—or under-brushy.

But at the top of the list was a song to be identified—a rich, melodious song. I knew right where to find the song, but it took forty-five minutes of waiting from different high spots on the trail until the bird finally ventured out, perched on a big rock, and poured out his soul in harmony. It was a bird I had seen in a museum and was able to recognize at once, the blue and white mockingbird, *Melanotis hypolencus*. The back was blue-gray; black cheeks contrasted with the snow-white breast. Its song was not as long as our mocker's, lower-pitched, less shrill. It seemed to say in soft Spanish and then in harsh English, "Guadal- Guadalquivir! Don't know you! Crash! Crash!"

I hurried back to the village with a great feeling of satisfaction, figuring it was well worth missing breakfast for such a thrill. But, although it was eight-thirty, I was not too late for my *café* and tortillas.

Soon we were zig-zagging up the steep, wooded mountain behind the Indian village, leaving it, on its grassy meadow, far below, and even below the village were deep canyons and distant hills. Slung over the pommel of the saddle were my binoculars and in my saddle bag three precious books, Peterson's two *Guides* and Sutton's *Mexican Birds*. I was ready for new adventures—snatched from my husband's itinerary—in birding in Mexico.

TV AND POTOMAC POLLUTION

(Continued from page 72)

condition of the Potomac River." From the Washington Lodge 15, Benevolent and Protective Order of Elks, came a plaque and congratulations for producer Finley. In November, 1954, the program was given the Sylvania TV Award for outstanding local public service.

In addition to tangible results and the praise that "Our Beautiful Potomac" attained, perhaps the most encouraging aspect of the whole experiment to those interested in conservation and the safeguarding of the nation's resources and natural beauty, is that a sizable television audience proved it is willing and anxious to have vital civic problems brought into their homes in a forceful and constructive manner, no matter how unappetizing they may be in themselves.

The possibilities for public service that TV presents, in conjunction with other media, seem limitless. No doubt the pioneering done by WRC-TV will serve as an example and an incentive to other television stations throughout the country, each station taking as a theme the most pressing or most neglected civic problem of its own particular area.

Our Resources

The Nation Looks at Its Resources. Edited by Henry Jarrett. Washington, D. C. 1954. Resources for the Future, Inc. 418 pages. $5.00.

This is the report of the Mid-Century Conference on Resources of the Future, which was held in Washington, D. C., from December 2 to 4, 1953, and which brought together a wide variety of individuals and interests concerned with our natural resources. This is a compendium of the discussions of the various sections into which the conference was divided, of their conclusions, and of the general distilization of the deliberations of the entire meeting.

Naturalists' Directory

A new issue of *The Naturalists' Directory* has just been published in its thirty-seventh edition. It lists, by geographical distribution, individuals interested in Nature in any of its many branches. Copies are available at five dollars from *The Naturalists' Directory*, 720 Fillmore Road, East Meadow, New York.

CAMERA TRAILS

(Continued from page 105)

its development does indicate something of the almost endless scope of modern photography. For an interesting illustrated folder describing the Microprint Reader, write to Eastman's Editorial Service Bureau, Rochester 4, N. Y.

High School Contest.

Now on for high school age photographers—and some of them do mighty good work with their cameras—is the 10th annual National High School Photographic Awards contest sponsored by Eastman Kodak Company. Cash prizes totaling $5000, plus national recognition, have been offered to the winning contestants.

The contest is now in progress, with the closing date set for March 31, and any public, private, or parochial high school student in the United States and its territorial possessions is eligible. Contestants may enter any number of pictures in any or all of the four classes into which the contest is divided. The primary requirements are that the pictures must have been taken by the student himself since April 15, 1954, and that these same photos have not been entered in other national contests.

The entries will be judged in four classes: (1) school activities; (2) people; (3) pictorials; and (4) animals and pets. There will be 256 prizes in all, with a top award of $300 in each of the four classes. Other awards in each class will be a $200 second prize, a $100 third prize, and a $50 special award. In addition, 240 honorable mention awards of $10 each will also be given.

Complete information about the contest may be obtained from National High School Photographic Awards, 343 State Street, Rochester 4, N. Y.

Bulletins and Booklets

"Birds the World Over" by Austin L. Rand and Emmet R. Blake is a 96-page, paper-bound booklet drawing for its illustrations on the bird habitat groups in the Chicago Natural History Museum, the text describing the birds shown in these groups. Available from the Museum for $1.50.

"A Population Study of the Alaska Fur-Seal Herd" by Karl W. Kenyon, Victor B. Scheffer and Douglas G. Chapman is Special Scientific Report No. 12 of the U.S. Fish and Wildlife Service.

"Colorado Butterflies" by F. Martin Brown is a 32-page illustrated booklet dealing with the Satyrs, Grass-nymphs and Wood-nymphs and is available from the Denver Museum of Natural History, Denver, Colorado, for 55 cents.

"Who Lives on Forest Farms" is another in the excellent series of comic-book style publications with a forest conservation message. It is sponsored and distributed by International Paper Company, Southern Kraft Division, Mobile, Alabama. An accompanying pamphlet contains correlative suggestions for teachers.

"A Visit to a Federal Fish Hatchery" is an eight-page, illustrated pamphlet published as Circular No. 28 of the U.S. Fish and Wildlife Service of the Department of the Interior, Washington, D.C.

"Free and Inexpensive Materials for Teaching Conservation and Resource-Use" by Muriel Beuschlein is now available in a new edition of 32 pages with added source references. It is published by the National Association of Biology Teachers and is available for ten cents from Dr. Richard L. Weaver, P.O. Box No. 2073, Ann Arbor, Michigan.

"Septoria Canker of Poplars in the United States" by Alma M. Waterman is U.S.D.A. Circular No. 947, and "Saving White Pines by Removing Blister Rust Cankers" by J. F. Martin and G. Flippo Gravatt is U.S.D.A. Circular No. 948. Both are available from Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., at 15 cents each.

"The Forest Resources of New Hampshire" is a 42-page bulletin published as Forest Resource Report No. 8 of the U.S. Forest Service. It is for sale by the Superintendent of Documents, Washington 25, D.C., for 45 cents.

"Cibolan Gold" is an attractive 24-page booklet collecting poems by Ruth Reynolds of Tucson, Arizona, who received the 1954 prize of *The Country Poet*, awarded to the poet receiving the most votes from readers of the magazine. It is published by *The Country Poet*, Sanbornville, N.H., in paper-bound and hard-bound editions. The prices appear to be a secret.

"Birds of Yosemite" is a special issue of Yosemite Nature Notes, picturing and describing the birds of this National Park. It is the work of Cyril A. and Robert C. Stebbins. This booklet, as one of 12 issues of Yosemite Nature Notes, is available for $1.50 to Yosemite Natural History Association, Box 545, Yosemite National Park, California.

"Point Lobos Wildflowers" is an attractive 36-page booklet, illustrated in color and black and white and issued by the Division of Beaches and Parks, Department of Natural Resources, State of California. The text is written by Ken Legg, and the illustrations are by Roland Wilson. It is available from the Printing Division, State of California, Sacramento 14, California, for fifty cents.

Directory of "Organizations and Officials Concerned with the Protection of Wildlife and Other Natural Resources" is compiled by Stewart M. Brandborg and published by the National Wildlife Federation, 232 Carroll St., N. W., Washington 12, D. C. It includes officers of national organizations, and federal and state officials. Twenty-five cents from the address given.

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THE INEXPENSIVE MOUNTAIN

(Continued from page 78)

exfoliation, which means the scaling off of the thin outermost layers of rock. Under the heat of the sun, the outer layers of the granite expand; as the sun sets, these layers cool rapidly and consequently contract. As granite is a poor conductor of heat, the heat of the sun affects only the thinnest outer layers and these, over a period of time, are forced to separate from the major unaffected portion of the granite. These loose layers then peel off in curved flakes or shells and are gradually carried away by the erosion of wind and water. Sharp, projecting corners are eliminated first and the outline becomes more and more rounded and dome-shaped. As the top becomes rounder and the sides steeper, it is increasingly more difficult for a covering of soil and vegetation to form and protect the surface from further erosion.

To account completely for the present shape of Stone Mountain we must add another force to that of the expansion and contraction caused by the sun—the force of chemical weathering. This is especially active in humid regions such as Georgia, where rain often soaks the outer layers. The addition of water, or hydration, to some minerals will change them chemically to other minerals, usually with an increase in volume. This volume change causes the outer layers to swell, separate from the fresh rock and be carried away. Sometimes, under favorable circumstances, the roots of tiny plants can work their way into these minute cracks and grow, enlarging the fissures and hastening the process of exfoliation.

Thus Nature, with her powerful erosive forces of wind and water, is fighting a mighty battle with one of the natural wonders of North America. But this war in which Stone Mountain has put up such a valiant fight seems only to foreshadow its ultimate doom. And it is amazing to think that one could have bought in 1790 this battlefield of erosion, with its hundreds of years of geologic history, for only a pony and a gun.

THE WAYS OF A MUSKRAT

(Continued from page 80)

Muskrat fur is more durable than many higher priced furs, and outranks all in utility. By the time furriers are finished with the pelt, the muskrat would not know its own coat. They pluck it, blend it, dye it or use it natural. They sell it under such names as Hudson seal, Aleutian seal, Red river seal, river mink, river sable and Russian otter. If dyed and plucked sufficiently it resembles seal so perfectly that only an expert can distinguish the difference.

If it were not for the unfortunate term of rat attached to its name, the muskrat might well become an important food by-product of the trapping industry. It was a staple food of the Indian. Ernest Thompson Seton regarded its flesh as superior to that of the canvasback duck. As it is, some muskrats are sold as marsh rabbits in the markets of Baltimore, Washington and Wilmington.

The muskrat may never become an important item of food. But it is doubtful if the muskrat will ever relinquish its preeminence as a furbearer. Seldom coming into conflict with man's interests, living in a variety of aquatic habitats that are of little economic value, and capable of extending its range wherever conditions are suitable, the muskrat should be with us for many years to come.

QUEEN OF THE CYPRESS BOG

(Continued from page 99)

leathery eggs. Then, forgetting their very existence, she made her way to her pool for a mid-summer meal of Congo eel.

Never would the snake know the fate of her eggs and young. No voice would tell her of the hungry skunk, which, prowling in the night, had crossed the sand above her nest, paused for a moment to sniff at the ground, then gone on a few yards more to tear into the nest of another of her kind and devour its fertile, living eggs. Nor would she know how half of her offspring that year had become infected with a host of greedy nematode worms, or how they had crawled out on the sand of the pine knoll to meet death, as the hungry parasites ate at their vital organs and covered their bodies with ugly sores.

And so it was that the self-appointed queen had lived for six years in her realm of the cypress bog, each year giving rise to a new generation of Ophidian rainbows. She was an old, old lady now, growing fat with age, and more than five feet long.

No one knows what strange force had called her from hiding on that day when Bill had found her. But now she was dead, and all the little creatures of the bog and the knoll, except perhaps the brightly colored carrion beetles that would come in the night to eat her flesh, had forgotten her. The otter still played in her pool, frightening the strange little gilled creatures with the delicate fins. The frogs had stopped their spring love songs, and were now hopping about in the treetops, or chasing spiders and crickets across the forest floor. A new family of white-footed mice had moved into the ancient oak tree, and far up in its branches a giant owl, with yellow eyes that seemed the size of lily pads, stirred in its slumber, dreaming of the night.

Yes, the old queen was dead. But, no matter. For up on the pine knoll above the cypress bog cool breezes were whispering through the pine trees, and in the sand beneath them were a host of tiny chambers, each filled with life, eager for the warmth of the autumn sun.

Wilderness Conference

"Building a Policy for Wilderness" will be the theme of the Fourth Biennial Wilderness Conference to be held at the Hotel Claremont, Berkeley, California, March 18 and 19. The Conference is under the sponsorship of the Sierra Club, and will provide an opportunity for all who are concerned with the preservation of natural areas in their natural state to meet and exchange views, discuss problems and propose action towards solution of some of those problems. Dr. Harold C. Bryant will be chairman of the Conference.

N. J. Audubon

Roger Barton, business magazine editor, has been named president of the New Jersey Audubon Society. He lives in Caldwell and succeeds Frank P. Frazier of Upper Montclair. Philip H. Grosch of Fair Lawn was chosen first vice-president and treasurer; Robert C. Alexander of Cape May, second vice-president; Norman F. Brydon of Essex Falls, secretary. The Society now has more than 1800 members and its address is 796 River Road, New Milford, N.J.

Mountaineering

A Treasury of Mountaineering Stories. Edited by Daniel Talbot. New York. 1954. G. P. Putnam's Sons. 337 pages. $5.00.

So far as we know this is a unique volume in that it is an anthology of the best mountaineering stories gathered from the works of the world's great writers and mountain climbers. Nineteen different stories have been selected by the editor, a few of them reasonably well known and many of them stories that will be new to almost all readers. Some might be described as "classics" in this field. The editor is not a mountaineer, but has long found a fascination in armchair climbing and seems to have made a wise selection for this anthology.

Along the Shore

Margins of the Sea. By Maurice Burton. New York. 1954. Harper and Brothers. 212 pages. $3.00.

This is the story of the tidal zones of the world, the life that is found there, and the evolution of its forms. This is a fascinating book written for the layman and, we should say, bound to stimulate individual interest in further exploration of that area that lies between the high and low tidemarks of the sea. The life there is often microscopic, greatly varied and immensely interesting in its relationship to the processes of evolution. Dr. Burton tells of it outstandingly.

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UNDER THE MICROSCOPE

By JULIAN D. CORRINGTON

THE ISMS OF PRISMS

IN ORDER to understand lenses and hence microscopes, the student of optics must first learn something about prisms. As we shall see later, a lens, as in a microscope, acts like two prisms, either base to base or apex to apex, with respect to the passage of light rays, and so it is only logical to study prisms before going on with lenses.

To begin with a definition, a *prism* is a solid body, the ends of which are similar, equal, and parallel polygons, and whose faces are parallelograms. In optics this body must be transparent, commonly of glass, sometimes of quartz, and may take any of numerous shapes. Primarily prisms are named from the shape of their ends, as triangular, quadrangular, or pentagonal; secondarily they may be named from their chief use, as refracting, reflecting, or dispersing prisms; and thirdly from their inventors, as Porro, Cornu, or Amici prisms.

Anatomy of a Prism

The simplest form of prism is the triangular one, having three plane *faces* and two triangular ends, each of which is a *base* (figs. 1 and 2). That face which receives the oncoming light (incident rays) is the *first face*, while that emitting the refracted rays is the *second face*. The line of intersection of these two faces

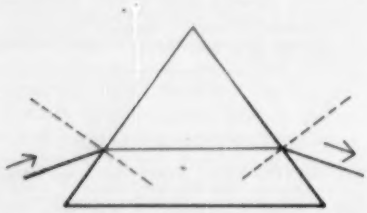

Figure 1. Deviation of a light ray by a prism.

is the *edge* and the dihedral angle made by these two faces at the edge is the *refracting angle*. It would, of course, be possible to send a beam of light through such a prism at any desired slant, but for purposes of simplicity in explaining the work of prisms, it is customary to show this solid in drawings (fig. 1) as a plane figure (in this case a triangle) and represent a cross section of the glass body made by passing a plane through it vertically to the faces or, as it is often stated, perpendicular to the edge. The photograph (fig. 2) shows one of the bases in this same plane and may be regarded as an optical section of this form of prism. Such a plane is a *principal section* of the prism.

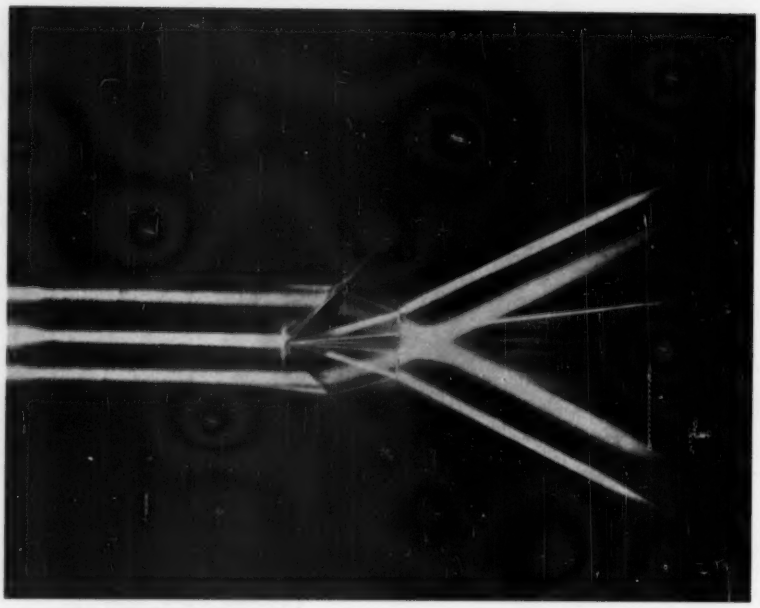

Figure 2. Parallel beams of light refracted by a prism. Photograph courtesy of Bausch and Lomb.

Physiology of a Prism

Before considering the behavior of a ray of light in passing through a prism, it will be useful to observe first the transmission of light through sheet glass; that is, through a piece of glass whose two faces are parallel, known in optics as a *plano plate* (fig. 3). We must have certain general laws in mind at the outset—that light travels in a straight line, unless interfered with, and at a uniform velocity of 186,000 miles per second across interstellar space. In order to have a standard of comparison, we say that the *refractive index* of light in a vacuum is unity or 1.00; which is another way of saying that the rays are not deflected at all. Even though our atmosphere at the earth's surface is dense as gases go, the interference with the passage of light is so slight that the calculation for the refractive index of air comes to 1.0003, and this may be taken as 1.00 for all practical purposes.

But now when a light ray enters water from air it is passing into a medium that, while still more or less transparent, is much denser, and the velocity is slowed; the refractive index of water is 1.33. That of ordinary glass averages 1.52. In other words, when light enters glass from air its velocity is even more reduced and, in spite of the extreme speed, this has actually been measured. Snell, in the 17th Century, computed that "when light passes from air to water the relation is always as 4 to 3, and when refraction occurs from air to glass the relation is as 3 to 2."

Pierre Fermat, 1601-1665, was a French mathematician who played a part in the invention of analytical geometry, the theory of numbers, and of probability. His *general principle* is one of economy in nature; that everything happens with a minimum of outlay. As a special case, the reflection of light by a plane mirror or refraction of light by a prism or lens is said to occur by the *principle of least time*; the path of a ray of light from one point to another is such that the time taken is a minimum. Mees has recently declared that "Of all principles in optics, this has been perhaps the most fruitful."

If rays of light are incident vertically on the first face of a plano plate, the rays pass through without *deviation*; that is, their direction is not changed. The velocity of the light is retarded. Upon emerging at the second face, the velocity picks up again. Thus a ray of light traversing plate glass is retarded in comparison with one that bypasses the plate. Should the incident ray be oblique, as in figure 3, it "hunts the shortest way through" by Fermat's principle, and we express this by describing the way it is *refracted* (bent) toward the normal (the perpendicular to the face) upon passing from a medium of less into one of greater density, and bent away from the normal upon passing from a medium of greater to one of lesser density. This is well shown in figure 3. The incident rays at the top bend toward the normal on entering and away from it on leaving; the direction of the emergent rays remains the same, but they have been offset. The plano plate is photographed with a base toward the observer, giving an optical section.

As a matter of interest in another connection, note the reflection of some of the incident light at the first face, observing the law of reflection, that the angle of incidence equals the angle of reflection; and note that the second face also reflects some of the light back through the plate, obeying the same law, the angle

Figure 3. Passage of light beams through a plano plate. Photograph courtesy of Bausch and Lomb.

being smaller, and that upon emerging from the first face, these second-surface rays are refracted so as to be parallel to those reflected at the first face. They will be in or out of phase with the reflected rays, depending on the thickness and composition of the glass. Figure 3 also makes clear the fact that at each surface in an optical system some of the incident light is lost through reflection and refraction; hence high power in a microscope requires stronger illumination than low power.

This figure will further explain what we meant in previous statements, especially in articles on *Optical Illusions*, that objects viewed through glass, as in looking out through a closed window, are not precisely where we think them to be. Prolong one ray in the photograph in a straight line through the glass and note that it goes to a point considerably at one side of the refracted ray. Everything seen through spectacle lenses partakes of this same phenomenon, being actually optical illusions, but since spectacle and window glasses are thin, the amount of displacement is very small and passes unnoticed.

By comparison, a ray of light passing through a prism is retarded, but it will also suffer deviation. This may be seen in the drawing (fig. 1), or by looking at the upper ray only in the photograph (fig. 2). The incident ray strikes the first face obliquely and is refracted toward a normal to that face; the emergent ray is bent away from a normal to the second face; but now *the two faces are not parallel* as they were in the plano plate, and as a consequence one angle does not cancel the other, but the second reinforces the first so that the ray is deviated still more. Its original direction has been permanently altered. The amount of deviation in any one case depends upon three factors: the refractive index—R. I.—of the substance composing the prism, deviation being greater, for example, in flint glass (average R. I. 1.7) than in the lighter crown glass (1.52); the angle of incidence, varying from zero when this ray is normal to the first face, to 42° for crown glass when the ray just grazes the face; and finally the refracting angle of the prism. Very thin prisms, with the two faces almost parallel, produce less refraction than a thick one, such as a 60° equilateral triangular prism.

To be scientifically accurate in studies of deviation of light by a prism we must use monochromatic light,—beams of uniform wavelength,—for, as Newton demonstrated, such a light beam cannot be *dispersed*. This is another property of prisms, dependent on the fact that white light, as that from the sun, is not a uniform subject, but consists of waves of radiant energy of all wavelengths between 760 and 380 millimicrons. The unit of measurement here is the millimicron, which is the thousandth part of a micron or the millionth part of a millimeter. Each wavelength refracts at a slightly different angle from every other. The cause is the difference in velocities and the result, following Fermat's principle, is a fanning or spreading out of the pencil of white light into all the component wavelengths, each affecting our visual apparatus as differences in color. The long wavelengths, visible to us as reds and oranges, are bent the least in their passage through the glass of the prism, and the short wavelengths, perceptible as blues and violets, are bent the most. Thus a rainbow of color results when light passes through a prism, as is

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often seen with glass prisms pendent from chandeliers. Laboratories often employ a yellow sodium light when testing prisms for deviation.

A prism is an optical appliance that tries to be all things to all men. To the astronomer, its chief virtue lies in its powers of dispersion, as in the spectroscope, whereas the naval officer prizes the ability of prisms to change the direction of light beams in his range finder and binocular. Some of these values are antagonistic—indeed, so much so that a simultaneous treatment of the various things that a prism does to an incident ray of light is confusing. As a result you will find deviation taken up in textbooks under the heading of refraction of light, leading to a comprehension of microscopes and telescopes, whereas dispersion is considered in another chapter, often many pages later, in which spectra are discussed, and each function is treated as if the other did not exist. We shall go on with the matter of prisms and describe the phenomenon of dispersion in our next installment.

SONGS FOR ZOOLOGY

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Peter Ilitch Tchaikowsky

None But the Lonely Heart

None but the natal heart can work such wonders,
Remake a fish's pump with so few blunders.
Placental blood is gone but Babe must carry on—
Ah! Obstetrician cruel is he who sunders!
None but the natal heart can work such wonders,
Seal off the oval window, end its plunders.
Botalli's duct must shrivel, prevent Blue Baby.
The lungs expand—Ah! How the first air thunders!
None but the natal heart can work such wonders!

THE BOOK SHELF

Evolution

IN SPITE of the fact that evolution is the underlying principle of natural science and philosophy, the number of books devoted exclusively to this subject is small. The first completely new one for some four generations of college students is *A Textbook of Evolution*, by Edward O. Dodson, Notre Dame. Likewise this is the first work for a long time that gives complete coverage and devotes an appropriate amount of space to every phase—to botany and to zoology, to paleontology and genetics, to morphology and ecology, to biography and geography. The analysis of the new is fully documented and detailed, but the old is not thereby neglected.

Part I defines the subject, gives a much fuller and more intimate picture of Darwin than is customary (although Lamarck is correspondingly slighted), discusses all of the evidences for evolution and ends with a chapter on the history of evolutionary thought, from Lamarck to the present. Part II treats phylogeny, evolution above the specific level, and contains excellent condensed accounts of all major groups of protista, plants and animals, with special emphasis on the chordates, ending with a chapter on anthropology. Part III is the origin of variation ("descent with modification"), being mainly an extended treatment of genetics. Part IV deals with the origin of species or, as another way of putting it, the origin of discontinuity, containing chapters on natural selection, variation, isolating mechanisms, polyploidy, and biogeography. Part V is retrospect and prospect, with some speculations on the future of man.

When Darwin wrote his *Origin of Species* he intended it as an exposition of his principle of natural selection, but the primary function of this work turned out to be the proving of the fact of evolution itself to the scientific world and the educated layman. In the same way, we venture to predict an unanticipated utility for Professor Dodson's admirably written book. It constitutes the best single-volume review of the entire field of biology that we have ever seen. Any student, and especially high school teachers who can take new work only summers, preparing for written and oral examinations for advanced degrees, could do no better than to study Dodson's *Evolution* thoroughly, from cover to cover. If they can digest and use this amount of information to a reasonably satisfactory degree, they can pass any test. Pp. xviii, 419; figs. 101. W. B. Saunders Co., West Washington Square, Philadelphia 5, 1952. $5.00

Biology

THE second edition of Garrett Hardin's *Biology: Its Human Implications*, is a great improvement over the first. Our criticism at that time (this Department, Aug.-Sept., 1950) centered mainly around the omission of subjects we considered essential in an introductory text, regardless for whom intended. These omissions have been supplied to some extent, especially in expansion of material on cells, mitosis, and taxonomy, and there are noteworthy new entries on diffusion and osmosis, use of specific problems in explaining the meaning of the scientific method (Harvey's discovery of circulation of the blood and Mendel's experiments in heredity); two chapters on the organism as a whole, one considering the internal adjustments, the other external adjustments; and the treatment of evolution is unusually fine.

The material on animalphyla is stilll scanty, but we will go alcng with the author's plan as now worked out, and regard this book as one of the best now before the college public. Dr. Hardin stresses general principles, human implications, use of sound common sense as opposed to prejudice or unfounded or unsubstantiated beliefs, and suppression of technical details as much as possible, so that the student will be able to see the woods, unobscured by a wealth of trees. In this he has succeeded admirably. The illustrations by Evan Gillespie are, as before, among the best in any text, and the format is now much more pleasing. Questions and problems at the end of each chapter are unusually well conceived. Altogether the book is modern, with a new approach, as different from the average biology text of a quarter-century ago as a modern abstract painting is unlike a van Meer. Pp. xii, 720; figs. 249. W. H. Freeman & Co., 549 Market St., San Francisco 5, 1952. $5.00.

General Biology

A very well balanced text for a full year course in general biology at the freshman college level is *Biology and its Relation to Mankind*, by A. M. Winchester, Stetson University. We especially liked the material selected for inclusion, the organization, style of writing, and illustrations. In past reviews of other general works we have frequently complained against the "shotgun" type of text, where the author crams in everything, including much advanced material that belongs properly in advanced courses. Dr. Winchester shows rare restraint, choosing aspects of subjects that are suitable and proper for the beginning course, and then knowing where to stop. He writes about his topics in a familiar style, interest-getting and easy to read. He is widely known as a biological photographer and we were not disappointed at either the number or quality of the photographic illustrations. Sometimes the line diagrams appear over-simplified, but they are purposely so drawn to bring out a point.

Part I, the "Foundations of Biology," contains chapters on the scope of the subject, cells, protoplasm, mitosis, vital life processes, and taxonomy. Part II deals with the plant kingdom, and III with root, stem, and leaf systems of higher plants; IV covers the animal kingdom and V the higher animal body by organ systems, chiefly of frog and man. Part VI departs from the usual and incorporates an idea that appealed to us as valuable. It is entitled "Some Important Divisions of Biology," and its eleven chapters take up microbiology in disease and industry, entomology, heredity, development, evolution, paleontology, anthropology, and history. Pp. ix, 777; figs. 418. D. Van Nostrand Co., Inc., 250 Fourth Ave., New York 3, 1949. $5.75.

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